AVIATION WEEK

JULY 4, 1949

A McGRAW-HILL PUBLICATION

What the pilot sees (or doesn't) brings him in safely (or doesn't)

L-M Airport Lighting

helps bring 'em back . . . alive

What the pilot sees when he looks from his instruments and onto visual contact or night determines whether he will make an easy, safe landing, pass over and try again, or—get into trouble. Without in any way minimizing the need for the best in electronic aids, L-M flyer-engineers and airport lighting specialists also recognize the vital importance of the best possible visual aids to landings. That's why L-M pioneered, and still leads, in high intensity runway lighting, and makes available the best in medium intensity units and control systems. For details write

Airport Lighting Division,
Line Material Company,
East Stroudsburg, Pa.

● L-M High Intensity Runway Light, at left, provides up to 180,000 beam candlepower, without glare, possible only because of the controllable beam feature. At the right is the L-M medium intensity unit, for smaller airports and secondary runways and taxiways at major ports.

● L-M provides complete equipment, such as the small control panel at left, for all types of airports. At right is L-M's small, highly efficient rotating beacon with ceiling height indicator and emergency candlepower control feature. Also available: obstruction lights; auxiliary equipment.

LINE MATERIAL Airport Lighting

R v.51 July-Sept. 1949

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

J-34 TURBOJETS

power the McDonnell XF88 "Voodoo"

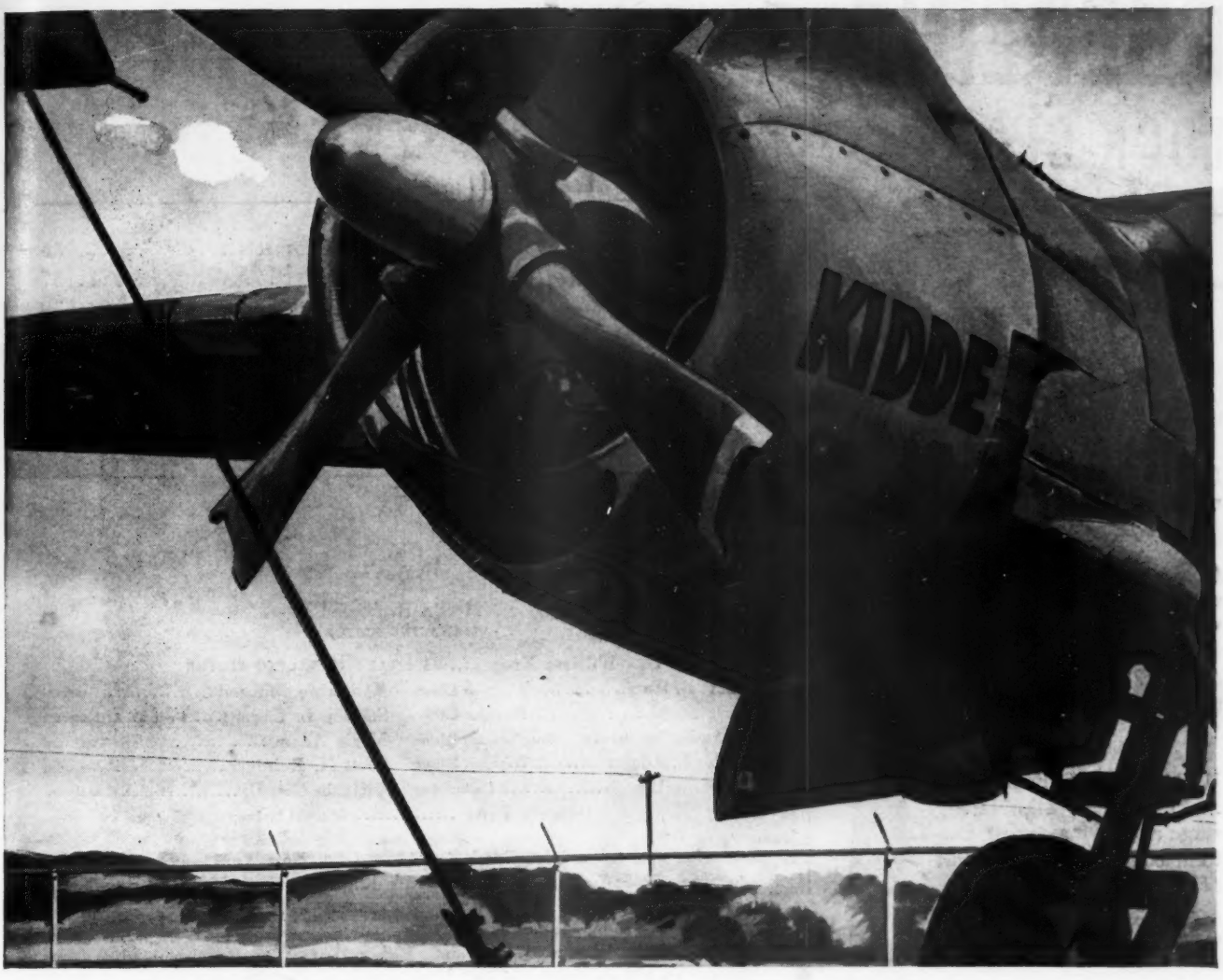
The XF88 . . . Air Force fighter . . . is the latest to join the ranks of McDonnell jet planes for the U. S. armed forces. Like its forerunners . . . the McDonnell FH-1, "Phantom", the F2H "Banshee", and the XF85 "Goblin" . . . the XF88 is powered by Westinghouse Turbojet Engines.

We are honored to supply the power plants for these outstanding new planes . . . welcome additions to the rapidly growing family of Westinghouse-powered planes for the U.S. military services.

J-50496

Westinghouse

AVIATION GAS TURBINES



One of aviation's oldest fire veterans!

Here's an engine that has been set on fire *more than 600 times!*

It's one of a pair of B-26 power plants here at the Kidde proving grounds — a unique earthbound laboratory where engine fires are born and die under conditions that simulate actual flight.

This fire veteran is the rear engine of a tandem arrangement. The front engine is the "slipstream"—its spinning blades drive back through the rear nacelle a racing wind that quickly fans fire into a roaring blaze.

Then . . . we turn on a blast of CO_2, MB, CB, DL—or one of the many Freons. Every one of these chemicals has its turn at the job—and we check the fire-killing speed of all of them with split-second precision.

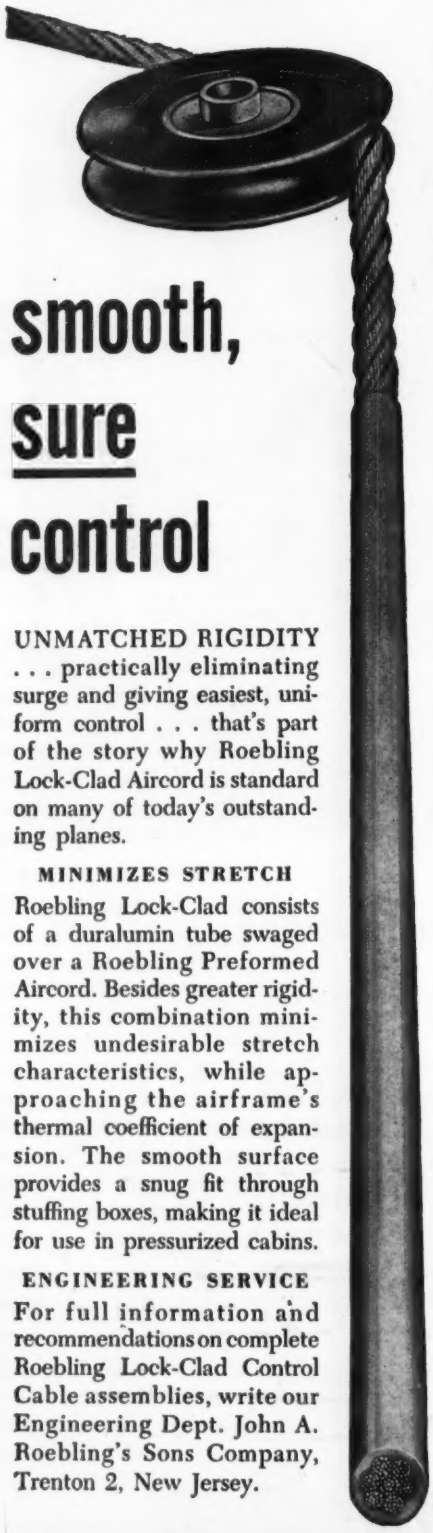
We've found out a lot about fire-fighting, naturally, in this busy laboratory of ours —and we're ready to pass on what we've learned to government agencies, plane manufacturers and airline operators. If you have a specific problem, we'll be glad to discuss it with you.

The word "Kidde" and the Kidde seal are trade-marks of Walter Kidde & Company, Inc.

Kidde

Walter Kidde & Company, Inc. • 718 Main Street, Belleville 9, N. J.

ROEBLING
LOCK-CLAD



smooth, sure control

UNMATCHED RIGIDITY . . . practically eliminating surge and giving easiest, uniform control . . . that's part of the story why Roebling Lock-Clad Aircord is standard on many of today's outstanding planes.

MINIMIZES STRETCH

Roebling Lock-Clad consists of a duralumin tube swaged over a Roebling Preformed Aircord. Besides greater rigidity, this combination minimizes undesirable stretch characteristics, while approaching the airframe's thermal coefficient of expansion. The smooth surface provides a snug fit through stuffing boxes, making it ideal for use in pressurized cabins.

ENGINEERING SERVICE

For full information and recommendations on complete Roebling Lock-Clad Control Cable assemblies, write our Engineering Dept. John A. Roebling's Sons Company, Trenton 2, New Jersey.

ROEBLING

A CENTURY OF CONFIDENCE

AVIATION WEEK

Vol. 51, No. 1 — July 4, 1949

News Sidelights	7	New Products	36
Aviation Calendar	8	Financial	37
News Digest	11	Sales & Service	39
Industry Observer	11	Air Transport	41
Headline News	12	Letters	50
Engineering	21	What's New	52
Production	32	Editorial	54

Robert H. Wood
EDITOR

Merlin H. Mickel
MANAGING EDITOR

William Kroger.....ASSISTANT MANAGING EDITOR

Robert B. Hotz.....News Editor
Irving Stone.....Technical Editor
Alexander McSurely...Manufacturing Editor
Charles L. Adams.....Transport Editor
Robert McLarren.....Engineering
Katherine Johnsen.....Congress
Stanley L. Colbert.....General Assignments
Marie Adams.....Editorial Assistant
Scott H. Reiniger.....Editorial Assistant
Victoria Giaculli.....Editorial Assistant
Henry Lefer.....Editorial Makeup

Executive and Editorial Offices: 330 W. 42d St., New York 18, N. Y., Phone Longacre 4-3035; National Press Bldg., Washington 4, D. C., Phone National 3414

Domestic News Bureaus: Atlanta 3, Rhodes-Haverty Bldg.; Chicago 11, 520 N. Michigan Ave.; Cleveland 15, Hanna Bldg.; Detroit 26, Penobscot Bldg.; Los Angeles 14, 621 S. Hope St.; San Francisco 4, 68 Post St.; Houston, 514 South St. *Correspondents:* Boston, Buffalo, Dallas, Dayton, Denver, Indianapolis, Jacksonville, Kansas City, Knoxville, Lansing, Louisville, Memphis, Miami, Milwaukee, New Orleans, Oklahoma City, Ogden, Philadelphia, Phoenix, Pittsburgh, Portland (Ore.), St. Louis, Salt Lake City, Seattle, Wichita and 43 other cities.

Foreign News Bureaus: London, Paris, Frankfurt, Tokyo, Bombay, Melbourne, Rio de Janeiro, Mexico City. Correspondents in Athens, Moscow, Buenos Aires, Shanghai, Zurich, Rome, Johannesburg and over 40 other cities.

ECONOMICS STAFF

Dexter M. Keezer, Sanford S. Parker, William F. Butler, Robert P. Ulin.

Robert F. Boger
PUBLISHER

J. G. Johnson, *Business Manager;* R. W. Martin, Jr., *Sales Manager;* Sales Representatives: J. C. Anthony, New York; M. J. Storz, Philadelphia; V. K. Dissette, Cleveland; L. J. Biehl, Chicago; W. E. Donnell, St. Louis; J. H. Allen, Dallas; R. C. Maultsby, Atlanta; J. W. Otterson, San Francisco; C. F. McReynolds, Los Angeles. Other sales offices in Pittsburgh, Detroit, Boston and London.

Member of Associated Business Papers, Inc., and the Audit Bureau of Circulations.

McGRAW-HILL PUBLISHING CO., Inc., James H. McGraw (1860-1948), Founder. Publishing Office, 99-129 N. Broadway, Albany, N. Y. Editorial and Executive offices: 330 W. 42nd St., New York 18; 520 N. Michigan Ave., Chicago 11; 68 Post St., San Francisco 4; Aldwych House, London, W.C. 2; National Press Bldg., Washington 4, D. C.; Architects Bldg., 17th & Sansome Sts., Philadelphia 3; Hanna Bldg., Cleveland 15; 2980 Penobscot Bldg., Detroit 26; Continental Bldg., St. Louis 8; 1427 Statler Bldg., Boston 16; Rhodes-Haverty Bldg., Atlanta 3; 621 South Hope St., Los Angeles 14; 738-39 Oliver Bldg., Pittsburgh 22. JAMES H. McGRAW, Jr., President; CURTIS W. McGRAW, Vice-President and Treasurer; EUGENE DUFFIELD, Senior Vice-President, Publications Division; NELSON BOND, Vice-President and Director of Advertising; JOSEPH A. GERARDI, Secretary; J. F. BLACKBURN, Jr., Vice-President and Director of Circulation . . . Aviation Week, 330 W. 42nd St., New York 18. Published weekly, price 50¢ a copy, 50¢ in Canada. Allow at least ten days for change of address. Address all communications about subscriptions to Director of Circulation, 330 W. 42nd St., New York 18, N. Y. Subscription rates—United States and possessions, $6 a year, $9 for 2 yr., $12 for 3 yr. Canada, $7 for 1 yr., $11 for 2 yr., $14 for 3 yr., payable in Canadian currency at par. Pan American countries, $10 for one yr., $16 for 2 yr., $20 for 3 yr. All other countries, $20 for 1 yr., $30 for 2 yr., $40 for 3 yr. Please indicate position and company connection on all subscription orders. Entered as second class matter July 16, 1947, at Post Office, Albany, N. Y., under Act of March 3, 1879. Volume 51, Number 1. Printed in U.S.A. Cable address "McGraw-Hill New York." Member A.B.C.

Copyright, 1949, McGraw-Hill Publishing Co.

Aviation Week is indexed in "Reader's Guide to Periodical Literature", "Engineering Index" and "Industrial Arts Index". Publications combined with AVIATION WEEK are AVIATION, AVIATION NEWS, AIR TRANSPORT, AERONAUTICAL ENGINEERING and AIRCRAFT JOURNAL.

All rights to these names are reserved by McGraw-Hill Publishing Co.

Airlift Pilots log 54,630 GCA* Landings

Since the Airlift began one year ago, GCA has been in continuous operation—24 hours a day. By mid-May 1949, even by Airlift standards, GCA's record was enormous.

Of the 54,630 GCA landings, 17 were "saves"; 4,807 were below IFR; 31,028 were IFR. Only 17,804 were VFR. In all "Operation Vittles" there was not one GCAccident, not one minute of radar failure.

Chosen by the USAF as its exclusive landing aid, GCA justifies this confidence. In one emergency, 26 Airlift C-54's were GCA landed in 26 minutes, three times the normal rate.

Military authorities say Berlin's 2½ million people could not have been fed without GCA's help. As GCA's pioneer developer and manufacturer for the USAF, Gilfillan is proud of its share in the Airlift's success.

Gilfillan
LOS ANGELES

GCA

RCA International Division
Exclusive Export Distributors

*Ground Controlled Approach

NORTHEAST AIRLINES has expanded its fleet with these luxurious, new 5-miles-a-minute Convair airliners. The Yankee Fleet of Northeast Airlines operates throughout New England, to New York and Montreal . . . has flown more than 26,000,000 plane miles since 1933. *Northeast uses Texaco Aircraft Engine Oil exclusively.*

Maintenance costs lose altitude . . .

Efficiency and economy climb when you use Texaco Aviation Products and Engineering Service

YOU can reduce the number of lubricants needed for your lubrication jobs . . . simplify your lubrication and maintenance procedures . . . by using Texaco Aviation Products and Lubrication Engineering Service. They have brought efficiency and worth while savings in maintenance costs to airlines everywhere.

Texaco Lubrication Engineering Service and the Texaco line of aviation lubricants and fuels work together. The outstanding quality of Texaco products and services is best evidenced by the fact that —

More revenue airline miles in the U. S. are flown with Texaco Aircraft Engine Oil than with any other brand.

Let a Texaco Aviation Representative give you the whole story for greater maintenance efficiency and economy. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, *Aviation Division,* 135 East 42nd Street, New York 17, N. Y.

TEXACO Lubricants and Fuels
FOR THE AVIATION INDUSTRY

NEWS SIDELIGHTS

Probe Problem

One of the big hitches in the congressional investigation of the B-36 is finding a lawyer to handle the show for Rep. Carl Vinson's Armed Services Committee. Job has been offered to a number of well-known Washington lawyers but no takers have been found. Another hitch is in getting adequate technical men to steer the investigators through the maze of aerodynamics and aircraft performance arguments that are sure to pop up. Most of the best technical men are too closely identified with either the aircraft industry or the military services to qualify as "impartial experts" sought for the probe.

Gray's Policy

Military procurement officials in the Air Force and Navy can take some tips from Army Secretary Gordon Gray on how to handle their procurement public relations. When Gray was assistant secretary of the Army responsible for procurement he established a procurement information center attached to his office where all of the latest information on Army bids, contract awards, and procurement policy was available for business men interested in Army business. Gray also took the lead in making public all Army contract awards over $100,000, a policy which USAF and Navy procurement brass are still bucking.

Loan Pressure

Congressional pressure may cause the Reconstruction Finance Corp. to back out of a $12 million loan to Northwest Airlines for Stratocruiser purchases. CAB recently approved the loan, but it has not yet been concluded by RFC. Key senators are convinced that the loan means that CAB will be obliged to grant sufficient mail pay to Northwest in the future to protect the government's investment.

Sen. Edwin Johnson (D., Colo.), chairman of the Senate Interstate and Foreign Commerce Committee wrote a letter over two months ago to CAB requesting that it clarify factors it would weigh in approving RFC loans to airlines, and what the significance and implications of its approval would be.

The letter has not been answered. But a Senate banking and currency sub-committee, headed by Sen. William Fulbright (D., Ark.), has summoned CAB members to testify on the matter. Richard Hellman, Federal Power Commission official who made an airline study for RFC last year, has opposed the Northwest loan before both the Senate Commerce and the Banking and Currency Committees.

Urging cancellation of the Northwest contract, Hellman argued that it would be foolish for the carrier to replace its DC-4s with Stratocruisers on its Orient run where flights average only 12 passengers. Hellman also suggested that a Stratocruiser fleet might require Northwest to obtain an additional $15 million loan for a Seattle base. RFC loan requests by airlines now total approximately $50 million.

Last Airmail Pickup

A unique chapter in aviation history is closed with the termination scheduled June 30 of All American Airways' airmail pickup service. Many of the same communities, if they have airports, will continue to be served by All American on its new air mail route 97. But now it's an orthodox airline passenger mail and express service with modernized DC-3 24-passenger transports.

The pickup service used small Stinson Reliant single-engine planes, and it took some precise low-altitude flying for the AAA pilots to hook A 10 ft. boom extended from the bottom of the plane into a nylon rope stretched between two poles on the ground to grab a mail sack from the ground.

It brought airmail service for more than a decade to many little towns in six eastern states which had no airports. And as by-products the mechanical features of the pickup system were adapted for use in heavy glider pickups, successfully used in World War II and the sensational human pickup also developed for military use.

Merger Rumors

TWA President Ralph Damon squelched rumors of a TWA-Northwest Airlines merger during his appearance before the Senate Interstate and Foreign Commerce Committee. Queried on the point by the committee's chairman, Sen. Edwin Johnson (D., Colo.), Damon denied that any discussions had taken place between the two carriers.

Johnson contends that no mergers can be worked out under present CAB policy. By the time the Board has processed a merger case, he estimated, the factors which prompted the move will have changed. "It seems that the CAB might very well outline mergers which it would approve, and then if the interested companies could work their problem out, they would know in advance that they were going to have CAB approval," the senator commented.

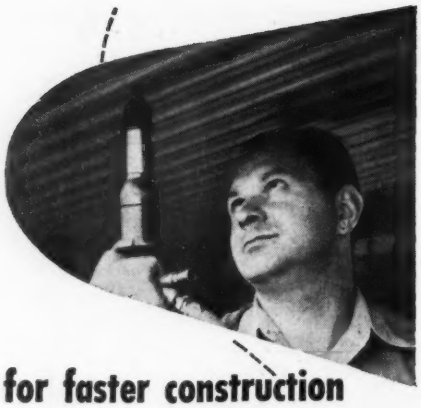
Airlift by Airship?

Goodyear Aircraft Corp. which can be depended upon to make the most of each opportunity to remind the U. S. government and public about big airships has done it again—this time with an engineering calculation of how 18 hypothetical modern dirigibles could handle the Berlin airlift at the rate of 4500 tons a day divided up into loads of 125 tons per flight as compared to a 25-ton load of the C-74, largest heavier-than-air transport used.

The Goodyear analysis prepared by T. A. Knowles, vice-president and general manager, points out that the short range of the airlift is not the type of operation on which the airship can do its most efficient work. In the case of the airlift however, Knowles estimates that the 18 dirigibles could carry required tonnage, in 1080 trips a month, using 600 crewmen, with 10,800 flying hr. and 2,970,000 gal. gasoline. This compares with 60 C-74s which would make 5400 trips a month to carry the same tonnage in 14,330 flying hr. using 8,725,000 gal. gasoline.

Other cargo carrying advantages of the big airship for the airlift cited: ability to land at a mooring mast in a relatively small, unprepared area; ability to deliver cargo without landing at all; ability to operate without serious risk in zero visibility conditions; ability to carry large individual items, weighing 15 to 20 tons each; adequate fuel reserve and ability to hover in emergency; low fuel consumption per pound of payload.

Knowles says that after the transportational pipeline has been filled and steady operations are established, the problem of a steady flow of a certain number of tons per week or month is one of regularity rather than the speed of single flights. The airplanes would of course have an advantage of probably 3 to 1 over dirigibles in airspeed.



for faster construction of faster planes

Chicago Pneumatic, pioneer in the development of airplane tools, offers the world's largest line of pneumatic and electric Air-Frame Tools, described and illustrated in Air Tools Catalog No. 564, Tenth Edition. A copy will be mailed on request.

CHICAGO PNEUMATIC TOOL COMPANY
8 East 44th Street, New York 17, N. Y.

AIR COMPRESSORS • AIRCRAFT ACTUATORS
PNEUMATIC and PNEU-DRAULIC RIVETERS
HYDRAULIC RIVETERS • ELECTRIC TOOLS

AVIATION CALENDAR

July 8—Second joint meeting, Institute of the Aeronautical Sciences and the Soaring Society of America, Elmira, N. Y.

July 10-13—Annual meeting, Natl. Assn. of University Administrators of Aviation Education, Kent State University, Kent, Ohio.

July 19-20—National Assn. of State Aviation Officials board of directors meeting, Grand Hotel, Mackinac Island, Mich.

July 21-22—IAS annual summer meeting, IAS Building, Los Angeles.

Aug. 6-14—1949 West Coast soaring championship, Palmdale Airport, Calif.

Aug. 7-14—Second annual southeastern soaring contest, NTAC airport, Grand Prairie, Tex.

Aug. 25-28—Flying Farmers national convention, Fort Collins, Colo.

Aug. 29-Sept.1—Aeromedical Assn. annual meeting, Statler Hotel, N. Y.

Sept. 1-7—International conference of Federation Aeronautique Internationale, Wade-Park Manor, Cleveland, Ohio.

Sept. 3-5—1949 National Air Races, Cleveland, Ohio.

Sept. 6-8—Annual spark plug and ignition conference, sponsored by Champion Spark Plug Co., Hotel Secor, Toledo, Ohio.

Sept. 7-11—10th Society of British Aircraft Constructors flying display and exhibition, Franborough Airfield, Hampshire, England.

Sept. 9-12—Clinic on maintenance of industrial instruments, Instrument Society of America, Statler Hotel, St. Louis.

Sept. 12—IATA fifth annual general meeting, The Hague.

Sept. 18-20—International Northwest Aviation Council convention, Spokane, Wash.

Oct. 5-8—SAE national aeronautic meeting and aircraft engineering display, Biltmore Hotel, Los Angeles.

Sept. 12—IATA fifth annual general convention, Long Beach, Calif.

Oct. 30-Nov. 2—Annual convention, National Assn. of State Aviation Officials, New Orleans.

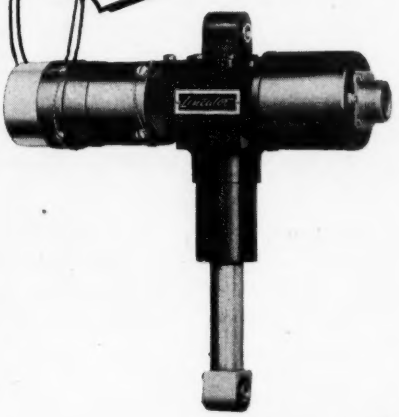
Nov. 9-11—Seventh annual meeting, Aviation Distributors and Manufacturers Assn., French Lick Springs Hotel, French Lick, Ind.

Jan. 13-15, 1950—All-American Air Maneuvers, Miami.

PICTURE CREDITS

13, 16—Fairchild Engine & Airplane Corp.; 26, 27, 29—Lockheed; 42—Boeing; 44, 45—Lockheed.

NEW MODEL

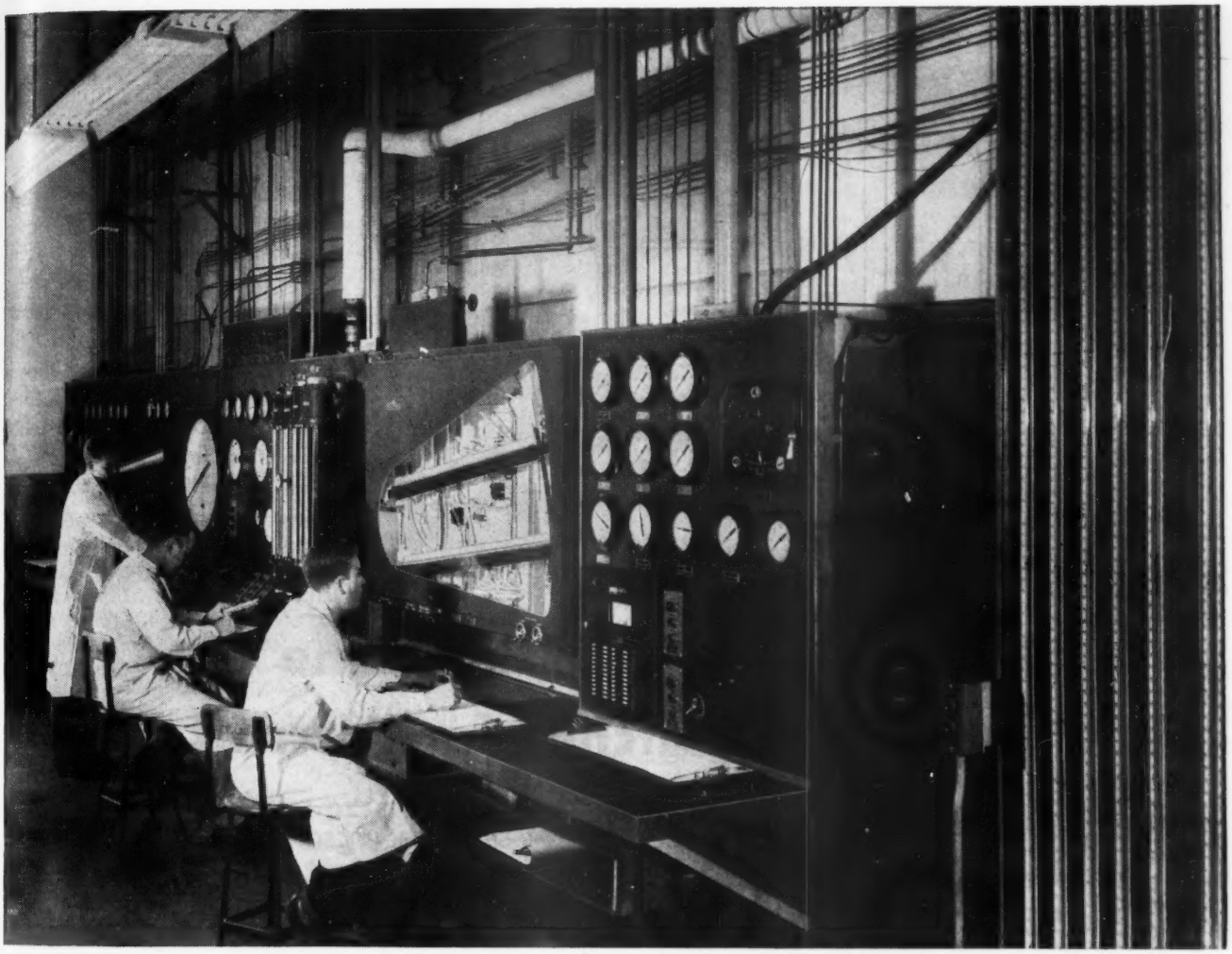


Lineator
ELECTRICALLY OPERATED
LINEAR ACTUATOR

- Increased Power
- Radio Noise Filter built in
- Reduced weight
- High Efficiency Ball Bearing Screw
- Optional Position Transmitter—
  1—General Electric D.C. Selsyn 3 wire Type 8TJ9 for use where accuracy independent of voltage fluctuations is desired
  2—Potentiometer for use with voltmeter indicator or for "bridge" circuit control
- "Center" or Intermediate Position Switch.
- Integral Instruction Plates for adjustment of Limit Switches and Transmitter
- Designed to Comply with Latest Specifications.

WRITE FOR LATEST LITERATURE!

AIRBORNE
ACCESSORIES CORPORATION
25 MONTGOMERY STREET • HILLSIDE 5, NEW JERSEY
Sales Representatives
JAMES L. ADAMS & CO. • LOS ANGELES 6, CAL.
W. N. WRIGHT • DALLAS, TEXAS



215 readings can be taken on this...one of several control panels in Wright Turbine Development Laboratory.

WHILE THE PRESSURE'S ON

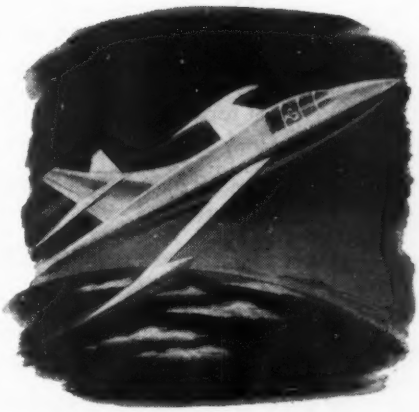
▸ *Accurate analysis* of an aircraft turbine engine... measuring its pressures and tremendous power... requires intricate component-by-component testing. That's because the turbine section of a turbo-prop or turbo-jet develops two or three times the net output of the complete power plant. The difference is required for driving the compressor.

▸ In Wright Aeronautical's integrated turbine development laboratory—with its 720 miles of wiring and gages requiring 600 pounds of mercury and nine miles of copper tubing—up to 357 separate, simultaneous measurements can be taken on a single engine.

▸ Here 15-foot-high *manometers*—pressure-vacuum gages—slide up and down on tracks to facilitate the accurate reading of pressures developed during test runs.

▸ Here *dynamometers* of 20,000 horsepower capacity absorb and measure power developed by a turbine wheel...powerful electric motors drive the test compressors... huge silencers muffle noise.

▸ Here is every facility for *precise research* on turbine engine components...to enable Wright engineers to develop more powerful, more efficient power plants for the aviation industry.

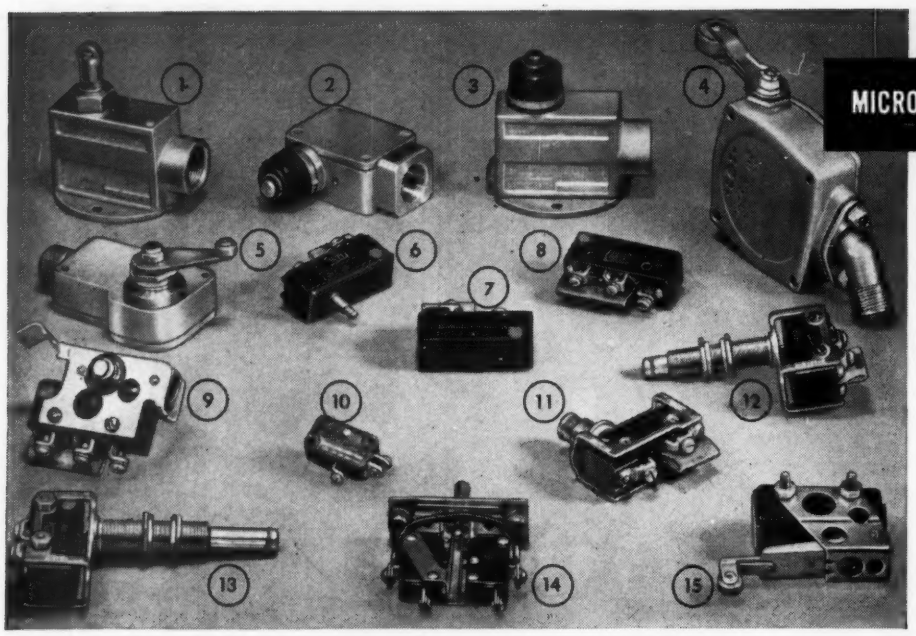


POWER FOR AIR PROGRESS

WRIGHT

Aeronautical Corporation • Wood-Ridge, New Jersey

A DIVISION OF CURTISS WRIGHT FIRST IN FLIGHT



MICRO...first name in precision switches

MICRO precision switches have long fulfilled the rigid "AN" requirements for aircraft design. Their positive, dependable performance combines with utmost economy of size and weight. Pictured here are a few of these switches, housings and actuators which MICRO SWITCH has built to conform to Army-Navy aeronautical specifications. For complete information call your nearest MICRO SWITCH branch office or sales representative.

MICRO . . . A Complete Line of "AN" Precision Switches for Aircraft Use!

1 Light weight, rugged, aluminum-housed switch (MICRO BZV-7RQ9T1) with roller plunger actuator. Designed to conform to **AN3218-2.**

2 Sealed plunger housing (MICRO 2VB1) for enclosing one or two MICRO V3-1 switches. V3-1 conforms to **AN3234-1.**

3 Light weight, rugged, aluminum-housed switch with sealed plunger (MICRO BZV-7RNT1). Designed to conform to **AN3217-2.**

4 Aluminum housing with roller arm actuator (MICRO LMR1). Conforms to **AN3233-1.** Designed to enclose basic switch (MICRO BZ-R31) which conforms to **AN3210-1.**

5 Aluminum housing with rotary actuator (MICRO 1VA1) for enclosing MICRO V3-1 switch. V3-1 conforms to **AN3234-1.**

6 "S" plunger basic switch (MICRO BZ-7RST). Conforms to **AN3215-1.**

7 Pin plunger basic switch (MICRO BZ-R31). Conforms to **AN3210-1.**

8 Pin plunger, split contact basic switch (MICRO BZ-3YT). Conforms to **AN3216-1.**

9 Lever arm actuator bracket (MICRO 9-10762RH). Conforms to **AN3170-1.** Designed for use with basic switch (MICRO BZ-R31) which conforms to **AN3210-1.**

10 Small, high capacity switch (MICRO V3-1). Conforms to **AN3234-1.**

11 Actuator bracket (MICRO MB2731A). Conforms to **AN3166-1.** Designed for use with basic switch (MICRO BZ-R31) which conforms to **AN3210-1.**

12 Actuator bracket (MICRO MC2711B). Designed to conform to **AN3168-1.** For use with basic switch (MICRO BZ-R31) which conforms to **AN3210-1.**

13 Actuator bracket (MICRO MC7711). Conforms to **AN3167-1.** For use with basic switch (MICRO BZ-R31) which conforms to **AN3210-1.**

14 Manually operated momentary-contact, three-position switch with toggle-type actuator (MICRO 1AT1). Designed to conform to **AN3235-1.** Unit contains two switches.

15 Roller lever actuator bracket (MICRO AD5721R). Conforms to **AN3169-1.** For use with basic switch (MICRO BZ-R31) which conforms to **AN3210-1.**

©1949 First Industrial Corp.

MICRO MS SWITCH

TRADE MARK ®

A DIVISION OF FIRST INDUSTRIAL CORPORATION

FREEPORT ILLINOIS, U.S.A.

BRANCH OFFICES: Chicago • New York • Boston Cleveland • Los Angeles

SALES REPRESENTATIVES: Portland • St. Louis Dallas • Toronto

NEWS DIGEST

DOMESTIC

American Airlines Convair-Liner, carrying 43 passengers from Memphis to New York crash-landed after leaving Memphis Airport, injuring 34. It was the first accident of a scheduled carrier in the U. S. since Aug. 29, 1948.

Joe Crosson, 46, manager of Northwest Air Service at Seattle, Wash., died at his Boeing Field office. He was widely known for his mercy flights in Alaska, where he was a pioneer bush pilot.

Douglas Super DC-3 made its first flight at Santa Monica, Calif., and was pronounced "livelier and even sweeter flying" than the DC-3, by John F. Martin, Douglas chief test pilot.

Robert L. Earle was elected senior vice president of Curtiss-Wright Corp. in charge of aeronautical operations. C. C. Pearson, C-W vice president, has resigned.

Carl G. Holschuh has been named vice president-manufacturing of Sperry Gyroscope Co.

Ralph S. Damon, president of TWA, was awarded the International League of Aviators American National Trophy in recognition of his service to aviation over the past 31 years.

Navy Industrial Assn. voted to change its name. It becomes the National Security Industrial Assn.

D. F. Carpenter resigned as chairman of the Munitions Board to return to private industry.

FINANCIAL

Continental Motors Corp. net earnings for six months ending Apr. 30, 1949, was $1,319,414, or 40 cents per share on the 3,300,000 common shares outstanding.

INTERNATIONAL

KLM Royal Dutch Airlines Constellation crashed in the harbor of Bari, Italy, with a death tol. estimated at 32, all aboard. Plane was en route from Netherlands East Indies to Amsterdam.

Dr. Miles G. Leverett was appointed technical director of Fairchild's Nepa project at Oak Ridge, Tenn. He formerly was director of the technical division of Clinton Laboratories.

Russian Airline Aeroflot has equipped most of its medium-distance routes with the new IL-12 twin-engine transport, the Soviet's replacement for the DC-3. Aeroflot now has between 275 and 300 "medium-distance" planes.

Australia's Qantas Empire Airways will buy an additional Lockheed Constellation, the first new aircraft order involving dollar payments to be placed since 1946.

INDUSTRY OBSERVER

► Convair-Liner may be first American turboprop powered commercial transport. Convair and Allison have had preliminary talks regarding use of the Allison T-38 turboprop on the Convair-Liner. Convair is already scheduled to use the T-40, a dual version of the T-38, on its new Navy flying boat, XP5Y-1. T-38 is now undergoing its 150-hour test in the nose of a modified B-17.

► Glenn L. Martin Co. is expected to get a navy production order for about 100 of its Gorgon ramjet powered missiles. Navy plans to use them for high speed anti-aircraft targets for the fleet.

► NACA Langley Aeronautical Laboratory has received an Air Force Cessna LC-126 for flight test of various devices to improve its landing and takeoff performance. Slots, flaps and boundary layer control will be added, the latter the first practical test of this new device on a personal aircraft type.

► Naval Ordnance Laboratory, White Oaks, Md., is developing a new high-altitude rocket to be known as the Zeus. Control equipment is being made by Sperry Gyroscope Co., but Navy has not yet designated an aircraft manufacturer to make the rocket shell and do final assembly of the components.

► Navy has conducted another series of climbing tests between the Grumman F8F piston-engine fighter and the North American FJ-1 jet fighter. From a standing start the F8F beat the FJ-1 to 15,000 ft. by more than a minute. In a zooming climb from 1000 ft. with full power the FJ had a 13-second margin at 10,000 ft. and the F8F stalled out trying to get to 15,000 ft. In a race from the ground at San Diego to an altitude of 25,000 ft. over El Toro (60 miles away) the FJ-1 arrived first by a minute and 40-second margin. In a simultaneous take-off it was found that the F8F was able to gain 5000 ft. before the FJ-1 could get its wheels off the ground.

► British now claims that the service ceiling of the latest de Havilland Vampire powered by a 4500 lb. static thrust Ghost turbojet is 56,000 ft. and that it is able to maneuver successfully at 50,000 ft.

► Royal Canadian Air Force also is reported to be interested in a power switch on its Canadair DC-4M North Star transports. The switch would be from Rolls-Royce liquid-cooled engines now used to the Pratt & Whitney air-cooled R-2800 engine. Trans-Canada Air Lines was previously reported (Aviation Week, May 30) contemplating this same switch for its commercial transports.

► Air Force is studying the possibility of heating bomb bays in future very-high-altitude bombers to keep the bombs warm in the frigid temperatures. Ordinary carbon steel bomb casings start to crack at temperatures of minus 20-30 C. and become wholly unpredictable at lower temperatures. Heated bomb bays will require pressurization, which introduces new problems of door sealing.

► Royal Air Force Gloster Meteor with an experimental installation of two Metrovick Beryl turbojet engines (4600 lb. thrust) recently recorded a climb to 40,000 ft. in 7 min. 31 sec. Takeoff gross was 15,445 lb. The Meteor reached 20,000 ft. in 2 min. 5 sec.

► Beverly Howard, international aerobatic champion is installing a new Warner 185 hp. engine in his German Buecker-Jungmeister biplane. The Warner will replace the old German Siemens engine which blew a valve. Weight and balance tests indicated the Warner is a perfect replacement.

Vol. 51, No. 1

AVIATION WEEK

July 4, 1949

Air Force Faces $800 Million Budget Cut

Rather than raise taxes or run up deficit, Congress seeks economy—and eyes AF.

The economy drive, now in full swing in Washington, threatens to knock $800 million out of the Air Force's budget for the coming year.

Faced with a multi-billion dollar federal deficit for the current year, the Truman Administration and the Congress have three alternatives:

- **Lapsing into deficit financing,**
- **Increasing taxes,**
- **Slashing expenditures.**

The last is the least distasteful to both.

Developments last week indicating that USAF would be a principal victim of the economy drive were:

- **Secretary of Defense Louis Johnson,** in a closed session of the Senate Appropriations Subcommittee on the armed services, placed himself squarely behind the $4.6 billion USAF budget recommended by the Administration, and withheld his support from the $5.2 billion budget voted by the House. The Administration program, including $1.6 billion for procurement of 1669 planes, contemplates a 48-group program. This compares with the $2.2 billion allowed for procurement of 2632 USAF planes for the current year.

The $851 million added by the House for USAF would implement a 57-group program, and provide for a total $2 billion program for procurement of 2550 planes.

The proposed cut in USAF budget would mean that the aircraft industry could look forward to military business out of fiscal 1950 funds slightly lower than the record peacetime appropriation of last year. The military budget passed by the House would have boosted military aircraft procurement (USAF and Navy) for fiscal 1950 to $2.9 billion for 3393 planes.

The original Truman budget for fiscal 1950 called for $2.3 billion in procurement funds for 2512 planes. Last year's appropriation contained $2.7 billion for aircraft procurement.

- **Senate Appropriations Committee** appeared set to eliminate the $800 million added to the USAF budget by the House. After concluding hearings, held in closed sessions, on the 1950 fiscal year National Military Establishment budget, Sen. Elmer Thomas (D., Okla.), chairman of the appropriations subcommittee on armed serivces, told AVIATION WEEK that he "definitely" favored striking out the funds. Sen. Chan Gurney (R., S. Dak.), a subcommittee member and former chairman of the Armed Services Committee, also flatly supported the cut.
- **Chances for a successful fight** to save the $851 million seemed dim. Unlike last year, when he openly fought for a 70-group USAF, Secretary for Air Stuart Symington is reported to be frigidly refraining from spurring USAF proponents in Congress to do battle for the 57-group program. Sen. Lister Hill (D., Ala.), a member of the appropriations subcommittee on armed services and one of the most ardent USAF advocates in Congress, told AVIATION WEEK: "My disposition is against cutting back to a 48-group program. But I might go along."

▶ **House Fight**—Should the Senate approve the cut in USAF funds, the House is not expected, however, to capitulate without a fight. Rep. Clarence Cannon (D., Mo.), chairman of the appropriations subcommitee, and Rep. George Mahon (D., Tex.), chairman of the appropriations subcommitee on the armed services, are the strongest proponents of a big strategic air force.

Thomas told AVIATION WEEK that the goal of his appropriations subcommitee is to reduce the Administration's $15 billion national defense budget by $1.5 billion, but that a $1 billion reduction would be "the minimum." In addito the USAF cutback, Thomas sugguested that the goal could be accomplished by rescinding from $200 million to $300 million in stockpiling funds and "making some cuts in other spots."

▶ **Await Studies**—Two studies now underway will have an important effect on the subcommitee's final action. They are:

1. A group of experts of the Hoover Commission are drawing up a report for the subcommittee detailing savings that can be made in the 1950 fiscal year military budgets through consolidations and reorganizations of activities. Legislation giving the Secretary of Defense additional authority to eliminate waste in the department, recommended by the Hoover Commission, is now pending before the House Armed Services Committee. It has already been passed in the Senate.

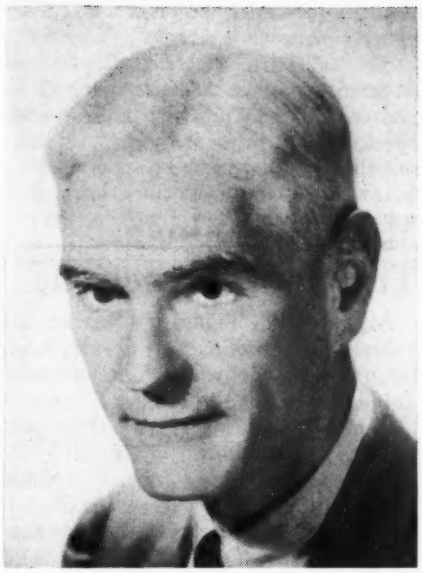
Testifying on the measure last week, Secretary Johnson assured that it would enable him to have in effect at the end of one year economies "at a rate of $1 billion a year." Later, Johnson declined to estimate for AVIATION WEEK what the savings would total for the 1950 fiscal year. Should the study of the Hoover Commission representatives demonstrate specifically that several hundred million dollars can be saved through efficiencies, it will somewhat ease the pressure for the USAF and for making other cuts in the military program.

"I want definite cuts to accomplish a $1 billion reduction in the military budget," Thomas observed. "I do not want to appropriate the money with the vague prediction that the Secretary will be able to save vast sums with his additional authority."

2. USAF is now making a detailed report on the comparative strength of the 48-group and the 57-group programs for the subcommittee, This will weigh heavily with USAF congressional supporters in deciding whether to put up a fight in the Senate for the bigger program aproved by the House. If, as is expected in some quarters, Secretary Symington minimizes the necessity for a 57-group program in the report it would pull the rug from under senators now inclined to support it.

Navigator Training

U. S. Air Force will begin to train aviation cadets as navigators for the first time since the war. First class is scheduled to begin Nov. 1 at Ellington AFB, Houston, Tex. Initial classes will use specially-modified Douglas C-54 and C-47 aircraft until the Convair T-29 navigational trainer begins to roll off the production line at Convair's San Diego division.



WARD—Withdrew retirement benefits.

FAIRCHILD—Would withdraw Ward.

Ward-Fairchild Showdown Due

Stockholders vote this week on opposing slates of directors, with management of company the stake.

Stockholders in the Fairchild Engine & Airplane Corp. this week will decide whether they retain Chairman J. Carlton Ward, Jr., and the present company management or accept Sherman Fairchild's proposed board of directors.

The issues, as seen by both sides:

• **Management:** Do stockholders want to return to "the Sherman Fairchild era" during which time the corporation lost money?

• **Fairchild Faction:** Do stockholders want "dividends, full, disclosure and team management in the place of one-man domination?"

Elimination of Ward's retirement benefits at his own request, as an issue in dispute (AVIATION WEEK, June 27) was greeted by the Sherman Fairchild group as "the biggest victory yet for our stockholders." But Ward, in a letter to stockholders, gave three reasons why he "should be allowed to go back" to the original contract, without the retirement features:

• **"A substantial number** of stockholders" did not understand or were not in favor of the new amendments.

• **Contract dispute** "was obscuring the real issue" which is "control of the corporation."

• **Fairchild faction's** proxy "made it difficult" for stockholders to express an opinion on Ward's contract without voting for Sherman Fairchild's board of directors.

Meanwhile, stockholders last week were presented with a new crop of developments:

• **Sherman Fairchild** stated he would not accept any office in the corporation if his slate of directors is elected. Richard S. Boutelle, former general manager of the aircraft division at Hagerstown, was nominated for president by the Fairchild group. Boutelle a vice president and director of the corporation, was relieved of his duties by management (AVIATION WEEK, June 13).

• **Twenty employees** at the Hagerstown division released a statement attributing the production and profit record of that division to Boutelle and Arthur F. Flood, former division comptroller, who was also relieved of duties by management.

Whatever the outcome of the election, Sherman Fairchild already has won his original fight, directed against the retirement provisions of Ward's employment contract.

Fair for Air?

Directors of the Air Transport Assn. voted last week to begin preliminary exploration of the possibilities of staging an air fair similar to the railroad exposition now running in Chicago. The railroad fair featuring the historic development of rail transportation and a display of modern railroad equipment has been an outstanding success.

ATA directors also approved a $360,000 budget for the last half of 1949 including an expanded program for the air navigation and traffic control unit. The new ANTC unit will be headed by Capt. San Saint.

Luscombe Seeks Reorganization

Voluntary petition for reorganization of Luscombe Airplane Corp. under section 10 of the Chandler Act was filed last week in Dallas U. S. District Court by L. H. P. Klotz, president.

Klotz said a shortage of liquid capital, and demands of creditors had forced the application. He reported assets of approximately $1.2 million including more than 400 acres of land appraised at over $800,000 and factory equipment and machinery valued at $400,000. Total indebtedness is listed at $500,000. He stated that the company had paid off $2 million in debts since October 1946.

Elijah Crippen, Dallas attorney, has been appointed trustee in charge of the reorganization, and present officers including Klotz are continuing under Crippen's direction. A reorganization plan will be drafted and submitted to the court at a later date. Meanwhile the company expects to continue production of its all-metal personal planes and work on several military aviation contracts and sub-contracts.

Puerto Rico Probe Finds C-46 Overload

New restrictions on nonscheduled planes flying between Puerto Rico and New York City have followed the Strato-Freight C-46 crash which killed 53 persons. And the Civil Aeronautics Board's investigation of the accident is shedding new light on travel agent practices.

The developments:

• **At Puerto Rico's** Isla Grande International Airport, departure point for the San Juan-New York run, police were called out to control near-riots when flights were delayed after Civil Aeronautics Administration imposed a regulation requiring a special type spark plug in C-46s.

• **Puerto Rican Government** previously ordered airport officials to weigh outgoing passengers and baggage to make sure they checked with clearance figures filed by the nonskeds (AVIATION WEEK, June 20).

CAB's investigation of the crash was held in San Juan. It brought out that:

• **The plane was overloaded** by 2473 lb. when it took off on the ill-fated flight, according to CAB investigators who weighed survivors and took sworn statements from relatives of missing passengers to determine correct weights. Earlier, some passengers had testified they had not been weighed before boarding the plane.

• **Strato-freight records** indicated the

craft had 65 safety belts, but the last inspection showed only 62.

• **Spark plugs** had been troublesome, according to the mechanic who handled maintenance on the craft in New York, but ultimately they fired readily. The mechanic added that although he knew this and other defects existed on the plane, he never told the captain, "because he did not have time."

• **Right engine magneto** was defective and not replaced, according to John S. Gary, Third Officer.

Strato-freight president H. L. Francis testified the travel agency which sold the tickets also prepared the official manifest.

He also disclosed that the agency charged $57 for a seat to New York, the company receiving $35 and the agency $22 per passenger.

Ticket agents testified they never weighed passengers but simply put the weight given by the passenger on the manifest.

Several survivors stated they heard "strange noises" from the engines immediately preceding the crash. One survivor stated he was a passenger, but made the trip as stewardess' aide. He said the plane was so crowded that three passengers had been forced to sit on boxes.

Others, he declared, sat three in a seat, making it impossible to fasten the safety belt.

▶ **More Coming**—CAB recessed the hearing after three days, but may resume it in Washington.

Earlier this year, the Puerto Rican government had urged CAB to adopt several measures leading to more and cheaper air service to the U. S. One of the requests by the Puerto Rican government: non-scheduled airlines be permitted to continue operating with considerable degree of liberty.

Pentagon Confab Ends Bendix Strike

It took 24 hours of continuous conferences at the Pentagon to end the 10-week strike at Bendix Aviation Corp. which was affecting production of parts for jets and other military planes.

Negotiators on both sides, headed by President Malcolm E. Ferguson of Bendix and President Walter P. Reuther of the striking CIO United Automobile Workers, went to Washington on invitation of Air Secretary W. Stuart Symington. Air Force representatives stayed out of the conferences, but Symington impressed both sides with the need for resuming production at the South Bend (Ind.) plant.

Announcement of the settlement was made early Tuesday by Symington, who praised both parties for answering his plea to end the strike. He also asked them to put out a "little extra effort" to produce the "critically short" items for the Air Force.

Details were withheld pending approval of the settlement by the union local, which represents about 5000 employees. Since local union officers participated in the Pentagon talks, no hitch in restoring production was anticipated.

For aircraft, Bendix makes carburetors, struts, wheels, brakes and fueling system parts. The company also makes automobile brakes and other parts.

The strike, at first unauthorized, began on Apr. 7 over the discharge of 47 men who engaged in a slowdown in protest against steps taken by Bendix to eliminate double pay while a machine is supposed to be "down." That is, being paid an hourly "down time," or standby, rate while the worker's machine was supposed to be idle for repair although, in fact, the machine had been restored to service and the worker was earning piece-work rates.

To halt this practice, Bendix instructed machine operators to check in and out on their job with a down-time checker. This brought the protest walkout that resulted in the discharges.

MATS Combines Transport Functions

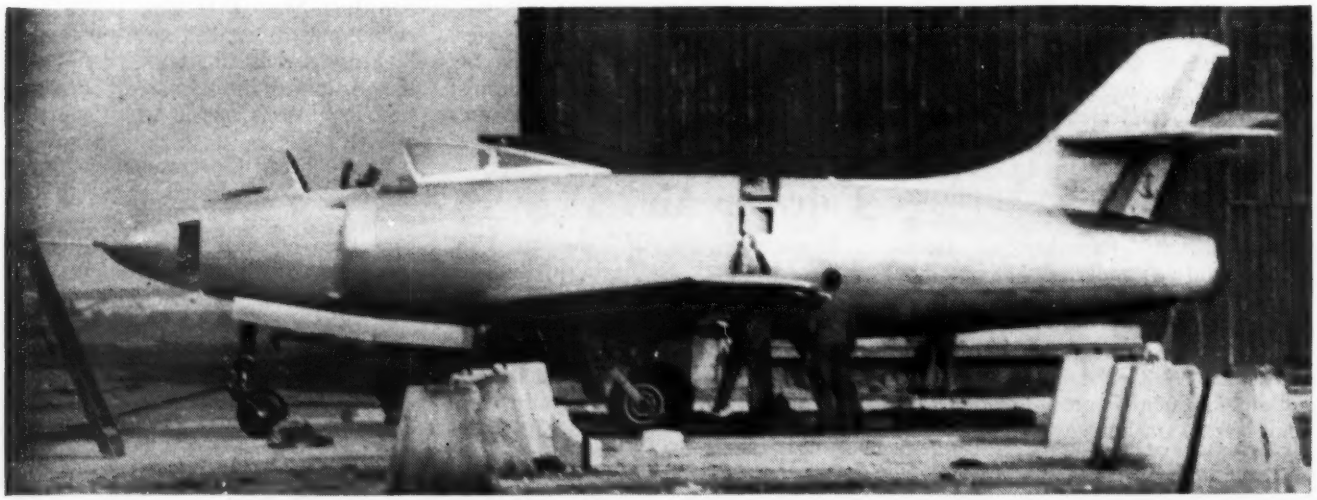
Military Air Transport Service has completed consolidation of all facilities and personnel whose functions were duplicated under the old Air Transport Command and Naval Air Transport Service organizations.

This consolidation was completed during the third quarter (Jan.-March 1949) of MATS operations. Among the other highlights of MATS third quarter operations report are:

• **Maintaining the world wide** air operations of MATS at 75 percent of their pre-Berlin airlift capacity despite the heavy concentration of MATS resources on and in support of the Berlin airlift. MATS has used Marine transport squadrons; the Mars flying boats of the Navy's fleet logistics support wing; and troop carrier squadrons of the Far Eastern Air Force to maintain its airlift capacity in the Pacific.

• **Success of the cycle maintenance** procedures used in support of the Berlin airlift. Airlift officials reported that C-54s returning to Germany after 1000-hour overhauls in the United States were in better condition than when they originally went on airlift duty.

• **Introduction of heavier type** transports for trans-Atlantic support of the Berlin airlift. MATS now has ten C-121As and seven C-74s operating regularly on the trans-Atlantic run carrying passengers and cargo.



NEW FRENCH NAVAL JET

First photo to show configuration of the Aerocentre NC 1080, latest French jet fighter, illustrates its profile resemblance to the Vickers Supermarine 510. NC 1080 is powered by a French-built Rolls-Royce Nene turbojet and was recently flown at Toussus-le-Noble, near Versailles. Advanced tests of the new jet fighter will be carried out at another airdrome.

• **New intensity of radar landing** and traffic control equipment use. MATS reported 27 "saves" of military aircraft during the first quarter of 1949 by GCA radar landing equipment that prevented the loss of $4 million worth of aircraft. MATS noted that this was far more than the original cost of the equipment used at 16 locations to make these "saves." MATS has now conducted over 36,797 GCA landings, about 10,000 more than were made by the entire Air Force during World War II.

• **Increased scope and intensity** of its air weather service including activation of a new weather reconnaissance squadron at Fairfield, Calif., for the Northwest Pacific area, and increased coverage of the Arctic.

• **Purchase of new type maintenance equipment** for C-54 and C-74 type aircraft. MATS has a contract with Safeway Steel Co. for 14 tubular steel maintenance docks for the C-54. Jumbo Steel of Los Angeles and Scaffold Engineering of Pittsburgh are building maintenance docks for the C-74. Another contract is being processed to buy 45 Cresci-Frederick hydraulic loaders capable of lifting 6 tons to a height of 180 inches. These loaders will service both the C-54 and C-74.

• **Total average operating** costs since July 1948 of $283.28 per flying hour for the C-54 and $134.90 per flying hour for the C-47.

Better Thunderjet

Republic F-84E, latest development of the Thunderjet fighter, features performance and maintenance improvements over previous models. Powered by the new Allison J-35-A-17 engine, which develops 5000 lb. static thrust, the new model is faster, has an 850-mile radius-of-action and a service ceiling above 45,000 ft.

Armament includes six .50 cal. machine guns, eight 5-in. HVAR rockets, two 1000-lb. bombs, two 500-lb. fragmentation clusters, depth charges, incendiary bombs and napalm tanks carried in retractable or jettisonable rocket and bomb holders. Maintenance improvements include 180 access doors, retractable battery lift, hinged gun deck, guide rails, snap-on electrical leads and throttle disconnects for rapid engine interchangeability.

The new F-84E has received a structural "beef-up" to increase its allowable "G" loads. The fuselage has been lengthened 15 in. to provide greater room for the pilot. Cabin pressurization and air conditioning equipment is improved. Tip tanks carry fins to permit full airplane maneuverability with tanks installed.

Initial deliveries of the F-84E will go to the 23rd Fighter Group, Howard Air Force Base, Canal Zone.

Air Races Program

Aug. 29-Sept. 1
Qualifying Trials

Sept. 3
Bendix Trophy (cross country) $25,000
Sohio Trophy (105 miles) $7500
Elimination heats Goodyear Trophy (midget racers)

Sept. 4
Tinnerman Trophy (105 miles) $7500
Women's AT-6 race, 75 miles $5500
Semi-finals Goodyear Trophy

Sept. 5
Thompson Trophy (225 miles) $40,000
Finals Goodyear Trophy (24 miles) $25,000

National Races Offer Record Purses

A triple play involving the ten fastest qualifying planes and offering a possible record individual purse of $27,650 will feature the 1949 National Races at Cleveland, Sept. 3-5. Total prize money offered will be over $110,000.

The triple play is a new deal that offers the fastest qualifiers a chance to parlay possible winnings in the traditional Thompson Trophy race with two $7500 purses offered in the Sohio and Tinnerman Trophy races.

▶ **New Plan**—Under the new plan, the 20 fastest qualifying planes will be listed in the order of their qualifying times. Ten will be entered in the Thompson on Sept. 5. The ten planes having odd numbers of the qualifying list will be entered in the $7500 Sohio race, Sept. 3 over a 105-mile closed course. The ten planes with even numbers will be entered in the Tinnerman Trophy race, Sept. 4, over the same distance and course with $7500 in prize money.

This arrangement gives pilots a chance to hit the $27,650 jackpot by winning either the Tinnerman or Sohio, taking first place in the Thompson and winning all of the Ludlum lap prizes for the 225-mile Labor Day grind. The 1949 Thompson has been cut down to 225 miles from 300 miles.

▶ **Goodyear Race**—Goodyear Trophy race for midget racing planes limited to engines of 190 cu. in. displacement has already drawn a record entry list of 49 planes to compete for the 32 starting places in the three-day competition beginning Sept. 3.

Five owners plan to enter two planes apiece in the Goodyear competition this year. These include: Herman "Fish" Salmon, Lockheed test pilot from Van Nuys, Calif., who won the 1948 Goodyear race but who will not fly himself this year because of an agreement with Lockheed (AVIATION WEEK, June 13); Sylvester "Steve" Wittman of Oshkosh, second place winner in 1948; Dave Long of Lock Haven, Pa., builder of the Midget Mustang; Luther Johnson, Greenwood, S. C., and Paul Schaupp, Inglewood, Calif.

▶ **Race-Horse Start**—Bendix Trophy cross-country race from California to Cleveland will be run in jet and piston engine divisions this year with a race horse start in California to provide a more exciting finish at Cleveland.

Air Force and Navy have not yet decided which will compete in the jet Bendix. Whichever service does not enter the Bendix will compete in the Allison jet race from Cleveland to Indianapolis and return on Sept. 4.

Bendix contestants will be required to report in their positions en route to CAA communications stations at Colorado Springs; Goodland, Kans.; Peoria, Ill.; and Fort Wayne, Ind. All of the 1949 racing card except the women's competition in AT-6s is open to foreign planes and pilots. Foreign planes entered in the Goodyear race must be powered by American 190 cu. in. engines.

▶ **FAI Meeting**—Federation Aeronautique Internationale will convene in Cleveland during the races with an eight-day session beginning Sept. 1.

Airlines May Buy Surplus Planes

Terms on which War Assets Administration will sell DC-3 and DC-4 airplanes now on lease to a number of airlines were announced last week.

Flat price of $125,000 each was fixed for the DC-4 passenger version (C-54-B) and flat price of $95,000 each for the C-54-B cargo version.

▶ **Price Formula**—DC-3 prices were set based on a formula which figures total airframe hours on each plane and hours since last major airframe overhaul. The DC-3 prices range from $15,000 to $20,000 for passenger DC-3s and from $10,100 to $15,200 for cargo DC-3s (C-47s).

Meanwhile it appeared last week that the general services agency bill following recommendations of the Hoover Commission which would combine WAA with several other government agencies was set for passage in both houses of Congress following approval of the conference report.

▶ **New Bill**—The bill had already passed the House in slightly different form. It would combine into a single housekeeping government agency WAA, Federal Works Agency, Bureau of Archives Bureau of Public Roads, and two treasury bureaus, Supply and Contract Settlement.

WAA has asked the airlines desiring to purchase planes on lease to take immediate action.

AF Projects

Armed services public works program improves Air Force facilities.

A $30,832,580 expansion of Muroc Air Force Base is provided in legislation authorizing a $598,125,682 armed services public works program. This includes experimental parachute facilities, armament engineering testing facilities, a radar and telemetering station, hangars, and rocket static test facilities.

The measure has been introduced by Chairman Millard Tydings (D., Md.) of the Senate Armed Services Committee, and Chairman Carl Vinson (D., Ga.) of the House Armed Services Committee.

Other Air Force projects:

• **Airways facilities**—For domestic navigational aids and communications facilities, $10,823,080; for repair and replacement of domestic airfield lighting, $1 million.

Facilities outside of the continent include $2,595,737 for air/ground radio stations; $3,741,183 for three multichannel single-side-band stations; $2,850,000 for northeast Loran chain; $1,181,661 for point-to-point communications facilities; $722,934 for ground-control approach facilities.

• **Petroleum storage**—$14.2 million for strategic bulk petroleum storage facilities, location undetermined.

• **Wright Field**—$3,340,010, including building and shop modifications and additions, a high-powered electric whirlrig, a vibration test building.

• **Almagordo, N. M., AFB**—$7,679,725, including instrumentation building and circuits to instrumentation sites, missile assembly buildings, photo laboratory, tracking device, telemetering and radar access trails in range area, technical building, upper atmosphere research station.

• **Biggs AFB, El Paso**—$4,717,000, including aviation fuel storage facilities and airfield pavements.

• **Campbell AFB, Hopkinsville, Ky.**—$496,000, including control tower and security fence.

• **Castle AFB, Merced, Calif.**—$6,171,000, including airfield pavements, runway extension, aviation fuel storage facilities.

• **Chatham AFB, Savannah**—$1,275,000, for aviation fuel storage facilities, airfield pavements.

• **Ellington Base, AFB**—Houston, $57,000 for celestial navigation training buildings.

• **Great Falls, Mont., AFB Base**—$7,051,000, including aviation fuel storage facility, airfield pavements.

• **Griffis AFB, Rome, N. Y.**—$3,114,500, for automatic radio grid direction finder laboratories, building alterations, development of instrument landing system, nava-globe system building.

• **Hamilton AFB Base, San Rafael, Calif.**—$2,192,000, including airfield pavements, aviation fuel storage facilities.

• **Hood AFB, Temple, Tex.**—$2,309,467, including operation building, control tower and fire crash station, night lighting, transformer building, fuel storage, obstruction lighting.

• **Limestone, Me., AFB**—$25,134,200, including fuel storage facilities, fire and crash station, bomb handling facilities, nose hangars, training school, communications and electronic facilities.

• **MacDill AFB, Tampa**—$4,412,000, including aviation fuel storage facilities, airfield pavements.

• **McGuire AFB, Trenton**—$700,000 for aviation fuel storage facilities.

• **Mount Washington, N. H.** (weather station)— $363,600 for climatic projects laboratory.

• **Otis AFB, Falmouth, Mass**—$1,150,000 for aviation fuel storage facilities and hangar.

• **Selfridge AFB, Mount Clemens, Mich.**—$600,000 for fuel storage facilities, airfield pavements.

• **Spokane AFB**—$6,645,000, including land expansion, airfield pavements, fuel storage facilities.

• **Toreence, Calif.**—$250,000, for ram jet test facilities.

• **Walker AFB, Roswell, N. M.**—$6,672,000, including fuel storage facilities, airfield pavements.

• **Engine overhaul** and test facilities, $7,990,000, at various locations.

Naval aviation expansions provided for in the measure include:

• **Inyokern, Calif.**—Ordnance test station, $10,992,000, including under water test facilities, static firing facilities for liquid fuels, aerodynamics ballistic track range, ballistic ground ranges and additional instrumentation for guided missile range.

• **Alameda, Calif., Air Station**—$950,000, for jet overhaul building.

• **David Taylor Model Basin, Md.**—$2,344,000, including wind tunnel, and completion of three-meter wind tunnel, free surface test facility.

Chincoteague, Va.,—Aviation ordnance test station, $1,165,000, including guided missile range and associated facilities.

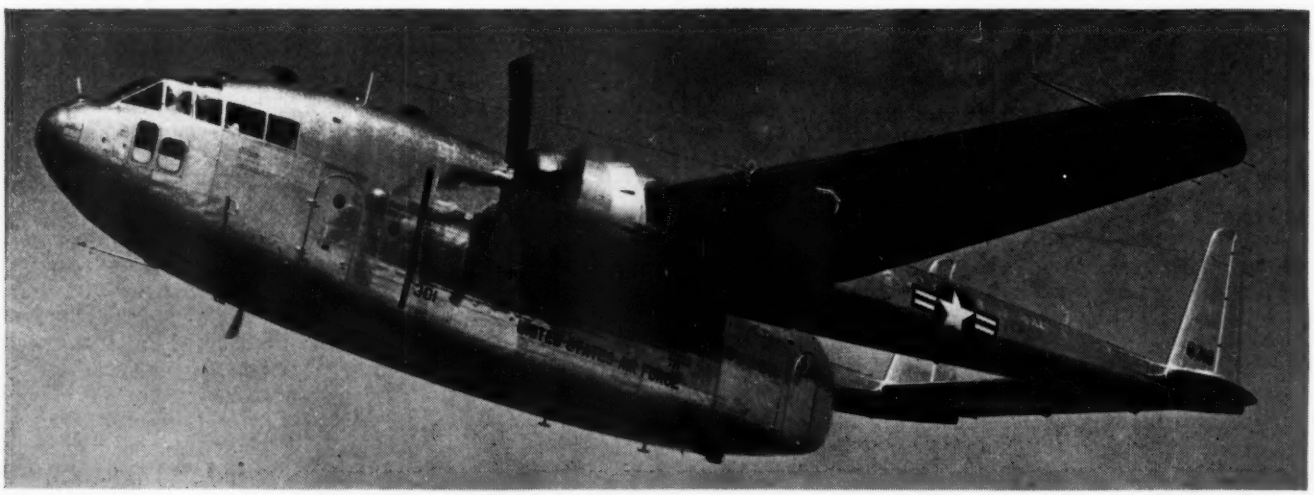
• **Daingerfield, Tex.**—Aerophysics laboratory, $864,500, for addition to wind tunnel test chamber.

• **Jacksonville Air Station**—$4,920,000, for aircraft berthing, turning basin and approach channel.

• **Johnsville, Pa.**—Air development station, $5,253,500, for runway extensions for jet operations, acquisition of aviation easements, test facilities.

• **Lake Denmark, N. J.**—Aeronautical rocket laboratory, $7,500,000, for rocket test and development facilities.

• **Norfolk, Va. Air Station**—$485,000 for test cells for turbine engines.



NEW FAIRCHILD PACKET FLIES

First flight photo of the Fairchild C-119B shows the greatly modified cockpit that is the main external characteristic of this new model troop carrier and cargo transport. Fairchild is building the C-119B for use by the Army Field Forces and the Marines.

• **Quonset Point, R. I., Air Station**—$300,000 for completion of two engine test cells.
• **San Diego Air Station**—$530,000, for turboprop engine test cells.
• **Whidbey Island, Wash. Air Station**—$35,800, for acquisition of 314-acre rocket target range.
• **Experimental Range**—$850,000 (location to be determined) for vertical firing for vt fuses and aircraft damage trials.
• **Fuel Storage Facilities**—To support jet operations, $5 million at various locations.
• **Runway Extensions**—For jet operations, $11,320,000, at Alameda, Calif.; Charleston, R. I.; Cherry Point, N. C.; El Toro, Calif.; Norfolk, Va.; Oceana, Va.; and/or other strategic locations.
• **Aviation Gas Storage**—Facilities, outside the continent, $3 million.

Air Force Contract Cancellations

Cancellation of $326,639,000 in aircraft contracts during the past nine months has cost the taxpayers approximately $42,734,000 of the U.S. Air Force appropriation for fiscal 1949.

The $326,639,000 in eight cancelled contracts involved 480 fighters and bombers and 10 transport helicopters. Bulk of the funds were re-allocated to purchase of 74 additional Convair B-36 bombers and modification of the B-36 to add four General Electric J-47 turbojet engines to the six Pratt & Whitney Wasp Major piston engines for which the bomber was designed.

Remainder of the funds was allocated to purchase Northrop F-89 jet night fighters; Boeing B-47 Stratojet (B-47 bombers); Lockheed F-94 jet night fighters; and Fairchild T-31 trainers.

Modification of Boeing B-50s for aerial refueling was also involved.

The $42 million loss was estimated by Air Materiel Command on the basis of the cost of materiel purchased by the contractors and allowances on work completed before cancellation. The AMC estimate is about 13 percent of the total value of the cancelled contracts.

USAF officials said it would be impossible to give an accurate figure on the final loss until all subcontractors claims were received. USAF acquires title to all material involved in the cancelled contracts.

Contracts cancelled included: Curtiss-Wright, 88 F-87 night fighters; Boeing, 43 B-54 bombers; North American, 51 B-45C bombers; 118 F-93-1 fighters; Northrop, 30 RB-49 reconaissance Flying Wings, and 30 C-125B transports; Kellett, 10 H-10 helicopters; and Republic 100 F-84C fighters.

Trend Seen Toward Large Distributors

COLORADO SPRINGS—Increasing number of airline purchases from large components and parts distributors is seen as one of the most important buying trends in current merchandising.

Airline purchasing agents are making the change in buying in many cases reluctantly, after convincing arguments by the distributors that airlines are saving money by letting the suppliers carry the inventory instead of tying up a large proportion of their own capital in parts and equipment inventory tucked away in their own hangars.

▶ **Two Meetings**—Sign of the times was the fact that airline purchases was a major item of discussion on the agenda of two simultaneous meetings, the aviation distributors and manufacturers meeting here, and the airline purchasing agents meeting at Denver.

Spearheading the distributors' merchandising campaign directed at the airlines is George W. Jalonick, III, vice-president of Southwest Airmotive, Dallas, who represented ADMA at the airline meeting.

Jalonick reported afterwards to ADMA that the airlines are wary of distributors who want to act only as "middlemen and order takers" and who do not themselves carry a sufficient stock to meet the airline requirements first hand.

On the other hand numerous cases were cited of airlines becoming regular customers of the big distributors, where they found that the distributors could supply the desired equipment quickly and at relatively low cost, especially if it meant that the airline could thereby relieve itself of carrying a big inventory of the items purchased.

▶ **Active Suppliers**—Southwest, Pacific Airmotive, Van Dusen Aircraft Supplies, Air Associates, and Snyder Aviation appear to be the most active suppliers in the air line picture currently, but other companies are also opening their warehouses to the airlines.

Sample of the changed trend and what it requires of the distributor to meet airline needs is cited by Jalonick from his company's recent experience.

Southwest assigned a salesman full time to airline usage surveys in connection with sales of Bendix Scintilla magnetos and associated equipment. Following the survey, Southwest more than doubled its existing inventory of Scintilla equipment. Additional usage surveys resulted in scheduling monthly orders to Bendix, and the supply house now stocks a Scintilla inventory six times the size of that carried normally in pre-airline days with commensurate turnover.

Rare View . . .

. . . OF S-52 IN LOOP is taken from strip of motion picture film made while Sikorsky's two-place helicopter was put in first intentional loop by Pilot H. E. Thompson.

DETROIT PUBLIC LIBRARY

Military Role

Senate group to study armed forces' surveys on aid of civil aviation.

The National Military Establishment will play a major role in determining the government's future policies toward commercial aviation.

At the request of Undersecretary of Defense Steve Early, the three services are now separately making comprehensive surveys to determine "the military needs which can be met in whole or in part through the aid of civil aviation, first, in peacetime, and second, in wartime."

Survey findings will be given great weight by members of the Senate Interstate and Foreign Commerce Committee in blueprinting the future course for the industry. The Committee's chairman, Sen. Edwin Johnson (D., Colo.), expects the surveys to be completed by late summer or early fall and plans to schedule meetings with armed services representatives at that time.

▶ **Defense Justification**—"The justification for the federal government spending hundreds of millions of dollars in promoting civil aviation, in numerous ways, has been that it is a vital adjunct of the national defense," Johnson told AVIATION WEEK. "Before we can determine basic policies toward civil aviation development, we must know how true this is, and to what degree and in which directions the government should continue to promote civil aviation for national defense reasons."

Views of the National Military Establishment are expected to set the Congressional attitude on such basic civil aviation issues as:

- **Federal development** of the airways, and whether commercial operators should be required to bear costs.
- **Whether contract** and all-cargo operators should be encouraged.
- **Whether the government** should sustain developmental costs on new-type transport and cargo aircraft.

▶ **Symington Letter**—A letter from Secretary for Air Stuart Symington to Orvis Nelson, president of Transocean Air Lines, indicates that the armed services may back maximum development of independent operators. It reads in part: "The Department of the Air Force realizes fully the necessity of supporting, whenever possible, the nonscheduled contract operators. . . ."

After several months of hearings on the financial condition of the air transport industry, general sentiment among members of the Senate Interstate and Foreign Commerce Committee and members of the Senate Appropriations Committee, who have closely followed the proceedings, is that the present rate of government outlay for civil aviation promotion—estimated at approximately $300 million annually by the Budget Bureau—is not adequately justified by the industry's contribution to either the commerce or postal interests of the country. The armed services' surveys will decide whether the outlay is justified for the national defense and whether federal promotion should be stepped up.

▶ **Committee Witnesses**—Latest witnesses before the Senate Interstate and Foreign Commerce Committee:

- **Ralph Damon,** TWA president, who laid major blame for the financial instability of airlines on "excessive competition" from nonscheduled and freight operators.

He called for: Civil Aeronautics Board jurisdiction over contract carriers; a study to determine "whether an equitable system of compensatory mail rates can be established in the domestic field, and if so, separation of these rates from subsidy payments"; CAB jurisdiction over passenger and cargo rates of international carriers; repeal of the 15 percent transportation tax; implementation of the Radio Technical Commission for Aeronautics' long-range all-weather air navigation facilities program.

When Damon opposed CAB control over airline financing, Johnson critically pointed to TWA's unbalanced position, involving approximately $54 million in debt financing and $10 million in equity financing.

The TWA president qualifiedly endorsed cheap coach services. But a general move toward coach service, he warned, would change the airlines' rate structure and "compound" their financial problem.

He opposed extensive financing by the Reconstruction Finance Corp. "The airlines should be sufficiently sound that a normal commercial banking operation should take care of them. . . ."

- **Andre de Saint-Phalle,** president of California Eastern Airways, maintained that the public interest requires that air transportation be made available to the greatest number at the lowest cost consistent with safety. He viewed the scheduled airlines system as subsidization of the wealthy, stating that last year the 16 domestic trunk lines received $48 million in mail pay for serving only 5 percent of the population.

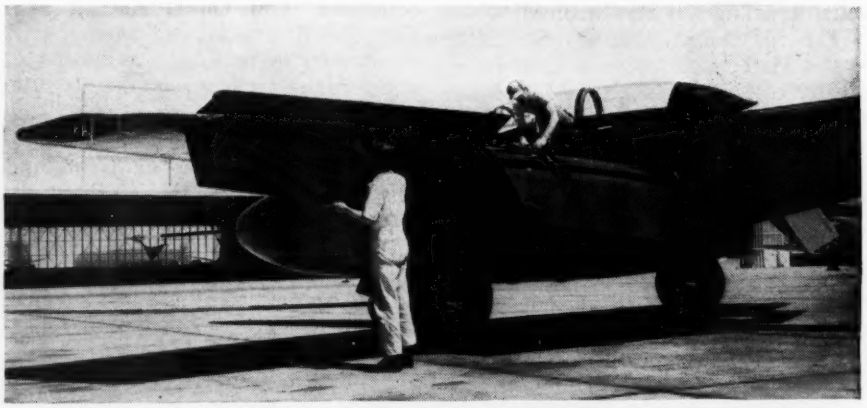
He said the regular airlines are incapable of meeting the needs of mass transportation, since "the type of thinking which produces a Hattie Carnegie dress or a Cadillac car cannot by its very nature produce a satisfactory Bond suit or Ford car. . . ." He highlighted the equipment difference for luxury and coach service: the DC-4 used in luxury service seats 44, but Cal Eastern's DC-4s, leased for coach service, seat 66.

The CEA president suggested that Boeing Stratocruisers could be adapted for skycoach service and carry passengers transcontinentally for $70 (three-cents-a-mile), compared with the regular fare of $157.85.

- **Orvis M. Nelson,** president of Transocean Air Lines, urged that contract carriers be given free rein to "fill in gaps in the scheduled air transport system."

While maintaining the wage scales of the scheduled airlines, he pointed out, Transocean has shown consistent profits on its operations: $450,000 for the 1947 fiscal year; $15,000 for 1948; and an estimated $400,000 for 1949.

Nelson called for certification of common carrier coach-cargo service to Europe, and the licensing of a carrier for world-wide air coach service, permitting it to institute and terminate services as dictated by traffic demands.



SPLIT AILERONS ON SCORPION

Historic Northrop interest in full-span flaps continues in the XF-89 all-weather fighter, shown with flaps extending from tip to tip. Wing thinness prevented installation of spoiler panels so split aileron was developed. In flight, surfaces function as conventional ailerons but lower portion may be split to provide flap action. Heavy structure permits use of flap in flight as dive or maneuvering flaps. Inboard flap panels are slotted design. Experimental version of the Scorpion is shown at Muroc Air Force Base, Calif.

NOW.. Specified for Aircraft Fuel Service

New Parker Rubber Compounds Never Shrink in Aviation Gasoline or Kerosene

* Parker compound PS-10-13N is approved under U. S. A. F. Specification 45007. Compounds also available to meet requirements of Navy Specification 33R14.

Parker O-Rings, fabricated of these compounds, are available in all standard sizes. Diaphragms, gaskets and other sections can be molded on special order.

Write today for Fuel O-Ring Bulletin 924

THE PARKER APPLIANCE COMPANY
17325 EUCLID AVENUE • CLEVELAND 12, OHIO
Plants: Cleveland and Los Angeles

• • •

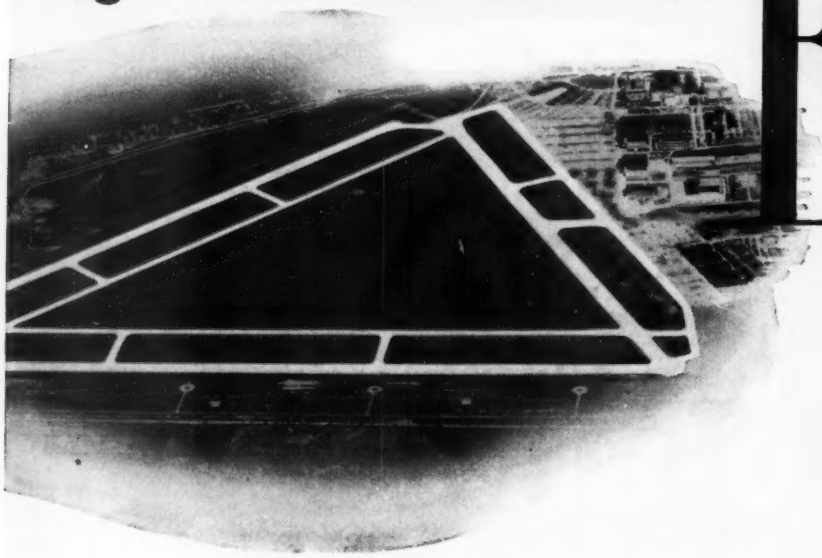
Parker Hydraulic O-Rings approved for AN-P-79. Write for Catalog 901.

• • •

OTHER PARKER AIRCRAFT PRODUCTS
AN and flareless Fittings.
Fuel Valves
Hydraulic Valves
Check Valves

Parker
TUBE FITTINGS • VALVES

Wright Field Demands the Finest



THAT'S WHY

Bendix-Skinner

JET FUEL FILTERS ARE THE CHOICE!

Wright Field, the heart of the U. S. Air Force, chooses Bendix-Skinner Filters for most of their jet fuel filtering. In fact, there are over 2,000 Bendix-Skinner Filters in daily use on U.S.A.F. bases all over the world.

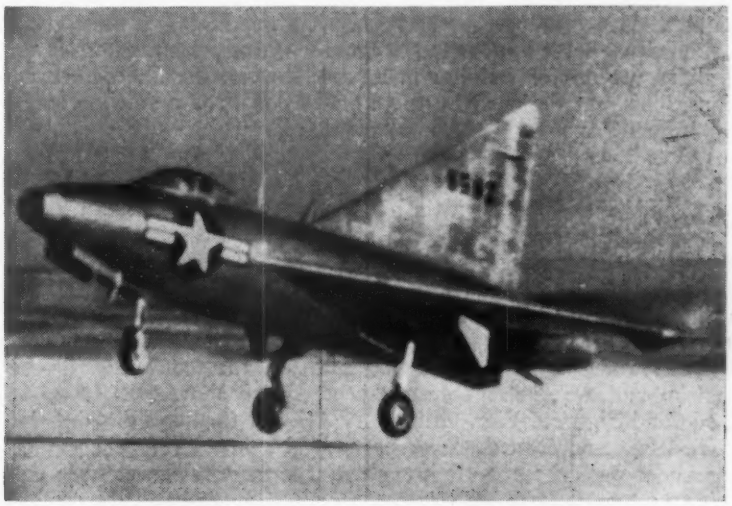
The fuel in jet engines *must* be kept free from contaminants, particularly water. If water is present, it freezes at high altitudes and may result in forced landings. To prevent this, Wright Field requires that all harmful water and all foreign particles larger than 5 microns (.0002″) be removed. So Bendix-Skinner Filters frequently get the call on Wright Field's refueling trailers, auxiliary carts and ground installations.

If Bendix-Skinner Filters can give continuous satisfactory performance at Wright Field, why not find out how they can solve *your* filtering problem? Our engineers will be happy to work with you.

SPECIFY BENDIX-SKINNER FILTERS FOR EVERY AIRCRAFT!

SKINNER PURIFIERS DIVISION OF
1500 Trombley Avenue, Detroit 11, Michigan
Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, New York

Bendix
AVIATION CORPORATION



FIRST DELTA-WING to fly, Convair 7002 (left) shows how a plane of this configuration must take off at a very sharp angle (right).

How Delta-Wing Aids High-Speed Flight

Unconventional planform combines advantages of low aspect ratio and sweepback, both reducing drag.

By Robert McLarren

Although it is now more than four years since cessation of hostilities in Europe, U. S. and British aerodynamicists are still exploring a wide variety of ideas developed by German scientists during the war.

It is now apparent that since the beginning of 1944 researchers at German aeronautical laboratories were convinced that supersonic flight was practical. Accordingly by far the vast majority of their work from that time to V-E Day was concentrated on problems of high-speed flight.

▶**Drag Reduction Stressed**—By the end of the war the Germans had clearly defined these problems and proposed the basic solutions. In the missile field, at least, they had actually attained supersonic speeds and were well along with solutions for piloted supersonic flight.

Aside from obvious problem of providing suitable powerplants, major problems in the attainment of supersonic flight were reduction of drag and provision of lift. Because dynamic pressure at supersonic speed is so great, lift coefficients need not be large, and this phase was laid aside in favor of the more serious difficulty of drag reduction.

▶**Dual Answer**—They provided two solutions to this problem, both working equally well independently, and even better when used in combination—wing sweep and low aspect ratio. Efficiency of these two solutions is now well known. Not only have U. S. and British laboratories compiled extensive data on these planform configurations, but numerous craft are now flying using either or both.

The "delta-wing" combines both these solutions into a single planform to produce a triangle shape resembling the Greek letter Δ. Although it combines the two major ingredients of drag reduction, the delta-wing is useful only in the special case of very high speeds, since flight at lower speeds can be accommodated more practically by moderate sweep and aspect ratios.

▶**Mach Factor**—Generally, angle of sweep is determined by the maximum Mach number at which it is desired to fly without excessive drag, assuming, of course, adequate power. The faster the design speed of a projected plane design, the greater must be the sweep angle.

For Mach 1.5, the sweep angle must be greater than 45 deg.; for M 2.0, sweep must be greater than 60 deg.[1]

To obtain a low aspect ratio (3 or less) with a practical delta-wing, it is desirable that leading edge sweepback be 45 deg. or more. Hence, the delta-wing platform finds its most suitable range of application in aircraft operating at speeds greater than M 1.5, having leading edge sweepback greater than 45 deg. and aspect ratio less than 3.

History

The proposal for a delta-wing planform originated with Dr. Alexander Lippisch, well-known German scientist. He was long associated with Deutsches Forshungsanstitut für Segelflug in the design of tailless gliders during the period of the armistice with Germany, which forbade powered aircraft.

During World War II, he was associated with Prof. Willy Messerschmitt in the design of the ME-163 Schwalbe rocket-powered fighter featuring sharply swept wings and no horizontal tail surfaces. Shortly after completing consulting work on this project he was made president of Luftfahrtforshung Wien, an aeronautical research laboratory near Vienna. Here he developed his ideas concerning supersonic aircraft design.

▶**L-13a's Delta-Wing**—Oddly enough, his studies on the subject came as a by-product of his paramount interest in the Lorin propulsive duct,, or ramjet engine. When his propulsion investigation had passed the wind tunnel and flying model stage, Lippisch began design of a supersonic research plane to test his powerplant.

This project, the L-13a, had a delta-wing planform with leading edge swept back 60 deg. The ramjet engine was built integrally with the wing center section and was to be operated by refined coal.

▶**Wing's Features**—The plane was to weigh 5060 lb., and had an estimated speed of 1020 mph. It incorporated a number of interesting design features including an elliptical airfoil section (to minimize transonic stability problems).

There was a gap of about three percent chord between wing trailing edge and control surfaces (to permit large control surface movement without the danger of reversal due to shock wave formation on the leading edge) and cooling air ducts between center section and outer wing panels to isolate the heat of the engine.

► **Initial Tests**—First, a model was tested in the Göttingen high-speed wind tunnel up to Mach 2.6. These trials showed the design to have marginal stability at high speed and wholly insufficient stability at low speed.

Consequently, it was decided to build a glider version for stability investigations. This was designed by the Flugtechnische Fachgruppe Darmstadt and completed early in '44.

► **Glider Not Flown**—It was built of wood and fabric, and carried a pilot in the center section, his enclosure comprising the fin leading edge. It was to have been carried aloft on the back of a Siebel Si 204 light transport and released at 25,000 ft.

Small water tanks provided changes in trim and a rocket motor could be used for high-speed dive testing.

Tests were never made, however, and the glider was subsequently brought to this country.

► **First Delta-Wing Flies**—The next delta-wing airplane (and first to fly) was not completed until four years later, but followed closely the general arrangement of the L-13a. The Convair Model 7002 made its first flight June 9, 1948 for a few miles at a height of only a few feet. Its first extensive flight was on Sept. 18, 1948. Both trials were at Muroc Air Force Base, Calif.[2]

This design differs from the Lippisch in that it has a fuselage housing the pilot and powerplant, and a thin, airfoil-shaped wing. Tests flights are continuing with the Model 7002, but results are not yet available.

Thus, the history of the delta-wing configuration is still meager—made up only of proposals and extensive wind tunnel tests in Germany and a few flights of a design built in the U.S. on the basis of these data, supplemented by wind tunnel tests at the Ames Aeronautical Laboratory of the National Advisory Committee for Aeronautics. But these data, together with greatly extended theoretical calculations, provide sufficient information on which to appraise this new and promising supersonic planform.

Lift and Drag

In addition to low drag, the delta-wing exhibits the unique characteristic of immunity to lift coefficient changes with Mach number.[3]

For example, the rectangular wing experiences a 20-percent increase in lift as Mach 1.0 is approached, an 80-percent increase as supersonic flow is established and a rapid deterioration of this lift with increasing Mach until it has dropped about 50 percent below its subsonic value at Mach 3.0.

In contrast, the delta-wing of low aspect ratio produces the same lift throughout this entire range from low subsonic to high supersonic speeds.

► **Lift Comparisons**—Despite this highly desirable characteristic, the lift coefficient of the delta-wing is considerably lower than that of a rectangular wing.

For example, from hydrodynamic theory, the lift coefficient of a conventional subsonic wing may be expressed: $C_l = 2\pi\alpha$, where α, the angle of attack, is expressed in radians.[4] First approximation for a very slender delta-wing gives a value of the lift coefficient $C_l = \pi A\alpha/2$, where A is aspect ratio.[5]

Since this approximation is valid only for very small aspect ratios, at a ratio of 2 this equation will have a value of $C_l = \pi\alpha$, which is only half the value of the conventional subsonic wing, given above.

A further approximation is obtained by integrating the pressures over the upper and lower surfaces and this produces $C_l = 4\alpha/\sqrt{M^2-1}$. Inspection of this equation indicates that it is higher than the conventional wing only at low supersonic speeds (up to Mach 1.2) but grows progressively lower as Mach number is increased.

► **Drag Analysis**—The low drag of the delta-wing is its justification and is made up of conventional friction drag, wave drag and drag due to its production of lift.

In general, friction drag of the wing will be of the same magnitude as the thickness drag, one of the terms in the wave drag.[6] In the absence of test data, its value is usually assumed at something less than 0.01, with a value of 0.006 being reasonable.

To this must be added the wave drag, which has been the subject of extensive theoretical study.[7, 8] The equation takes the same form of the lift coefficient plus the addition of thickness drag, mentioned above: $C_d = (4/\sqrt{M^2-1})(\alpha^2 + t^2)$, where t is wing thickness divided by the chord.[9] This may be rewritten as $C_d = \alpha C_l + 4t^2/\sqrt{M^2-1}$, clearly isolating the drag due to the thickness ratio.[10]

► **Supersonic Condition**—At subsonic speeds it is customary to divide the drag into two parts—a friction drag and an induced drag, the latter produced as a consequence of lift. At supersonic speed, drag due to production of lift can no longer be called "induced drag," since pressure changes in the trailing vortex cannot propogate forward and influence flow conditions.

The drag due to the lift at supersonic speed is a complex function which will not be repeated here, but it is proportional to the square of the lift coefficient.[11]

Because drag of a delta-wing at supersonic speed is proportional to the square of the thickness ratio and the square of the lift coefficient, it would follow that low drag is obtained when both thickness ratio and the lift coefficient are low.

However, use of an extremely thin wing, poses, in addition to structural considerations, an interesting aerodynamic problem.

► **Leading Edge Action**—Since the delta-wing leading edge is swept behind the Mach cone at moderate Mach numbers, an infinite velocity exists around the leading edge, the same as that assumed in satisfying the Kutta-Joukowski condition in subsonic flow.

If the leading edge is rounded, this infinite velocity is reduced to a large, but finite, value, pressure is reduced at the leading edge and a suction force is created. This suction causes the resultant force on the wing to be inclined forward relative to the chord plane, and the drag due to the lift is reduced proportionately.

Thus, a sharply pointed leading edge robs the delta-wing of this induced thrust." Requirements for extreme thinness are, therefore, in conflict with that for an adequately-rounded leading edge.[12]

It is interesting to note however, that Lippisch used an extremely generous leading edge radius-of-curvature on his delta-wing glider, although it is not known whether he had discovered the mathematical reasons for such a configuration at the time.

Stability and Control

It is now well known that the slope of the lift curve is reduced by reductions in aspect ratio and by increases in sweep angle.[13] This indicates, of course, that the angle of attack required to obtain a given lift coefficient is increased proportionately.

Delta-wing airplanes, then, require very high attitudes for landing and takeoff within distances comparable to those for conventional aircraft.

These attitudes need not be used when sufficient runway is available for the takeoff and, because of other considerations to be shown, power may, and probably will, be used in landing delta-wing aircraft to reduce the attitude for touchdown and provide sufficient energy for the flare.[14]

► **Stability Considerations**—In general, the delta-wing pitching moment is stable so long as its aspect ratio is held quite low.[15] This requires that a 45-deg.-swept delta-wing have an aspect ratio not greater than 3 and a 60-deg. design an aspect ratio not much more than 1.

This stability holds true up to the stall, although experimental data are in conflict in the region of the stall. At this point, the low damping in roll of the delta-wing becomes a vital consideration and some model tests indicate actual autoratation at the stall due to this characteristic.[16]

S-700

S-200

S-100

S-50

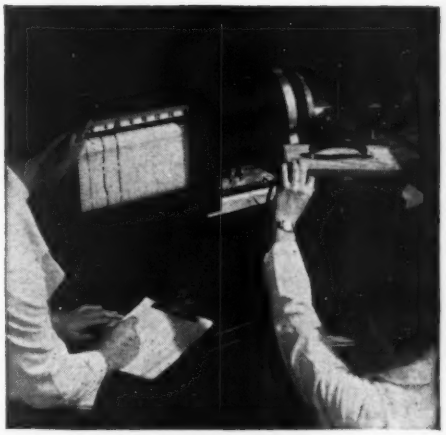
S-25

V-15

here's why janitrol heaters get better

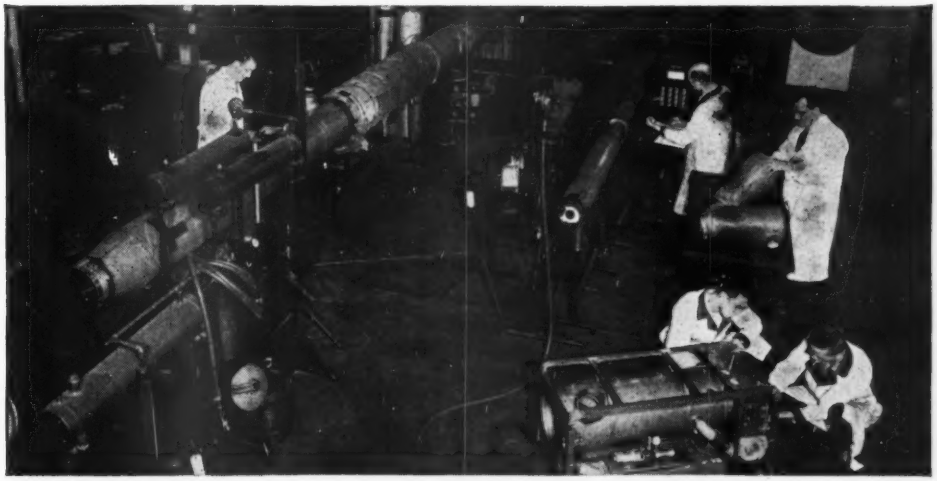
and Better!

Quiet please. In this shielded "radio quiet" room, Janitrol electrical components are checked to insure against their producing unwanted interference with radio equipment.



Temperatures taken continuously. Improved combustion efficiencies, lighter weight, longer life for Janitrol heaters result from such precise performance tests as this.

Pipe dreams come true in Janitrol's modern spacious laboratory in Columbus. Aircraft heating engineers benefit from Janitrol's "treasury of information" on heating problems in many other fields. Low temperature and altitude tests are made at the Cornell Aeronautical Laboratory.



Janitrol heaters have been on a "reducing diet" for many years, have become smaller and more compact, greater in heating capacity, longer in life, and more versatile in their applications. They are backed by a research and service organization second-to-none in the industry. Whatever your aircraft heating problem, consult Janitrol with confidence. Write for your copy of the new "Aircraft Heating Digest," a new quarterly service publication of interest to aircraft designers, builders, and operators.

Janitrol

AIRCRAFT AND AUTOMOTIVE HEATERS *with the whirling flame*

AIRCRAFT-AUTOMOTIVE DIVISION • SURFACE COMBUSTION CORP., TOLEDO 1, OHIO

New York, N. Y., 225 Broadway • Kansas City, Mo., 950 Dierks Building • Los Angeles, Calif., 714 W. Olympic Blvd.

Other tests indicate marginal longitudinal stability at the stall, particularly for extremely high degrees of sweep.[17]

One of the difficulties of predicting low-speed derivities for delta-wings is the unpredictable effects of flow separations at high angles of attack required for the stall.[18] These angles may often have values as high as 40 deg.[19]

▶ **Low-Speed Data**—Some interesting results of low-speed tests of delta-wing planforms are available from captured German reports of work done at DVL.[20, 21]

These data show a strong lateral flow development over the rear of the wing moving towards the tips. Since this flow results in low pressures, lift is increased.

This increase in lift at high angles of attack produces a peculiar concave discontinuity in the lift curve and the slope actually begins to increase from $C_l = 0.4$ on up.

This flow also produces a rearward shift in the neutral point, the lift coefficient at which this shift begins decreasing with decreasing aspect ratio and increasing sweep angle.

A further result of this flow is a paradoxical increase in $C_{l_{max}}$ with decrease in aspect ratio.

▶ **NACA Results**—Although extensive test data on delta-wing planforms has now been compiled by NACA, the only unclassified results available contain data on a model having 63.4-deg. sweepback on the leading edge, aspect ratio of 2 and an NACA 0012 airfoil, the same section used by the Germans in their tests, previously outlined.[22]

These data show a maximum lift coefficient of 1.7 at an angle of attack of 35 deg. But of major interest is that this lift coefficient was attained at a point about 40 percent of the semi-span outboard of the longitudinal centerline. Maximum lift coefficient attained at the centerline was only 1.05 at an angle of attack of 48 deg. This illustrates one of the important practical characteristies of the delta-wing, its wide variation in span load distribution with angle of attack at low speeds.

In these tests, maximum span loading coefficient moved outboard from the centerline (at 4.3 deg.) to a point 60 percent of the semi-span at 22.7 deg. and then moved back inboard again to the centerline at the stall.

Center-of-pressure moved inboard with angle-of-attack from 42½ percent semi-span at zero deg. to 30 percent semi-span at 48 deg.

Throughout these tests, however, the wing center-of-pressure remained constant longitudinally at about the 40 percent mean aerodynamic chord location.

▶ **Tip Stall**—These data indicate that despite earlier optimism, the delta-wing is subject to the tip-stall propensity which a cursory examination of the planform would suggest, since its spanwise lift distribution is theoretically infinite along the leading edge and sinks to a very low value along the centerline.

This theoretical distribution is only modified slightly in practice (since infinite velocities are reduced to high but finite values), resulting in the planform stalling at the tips first and this, coupled with the low damping in roll, combines to create serious low-speed stability problems which will undoubtedly require high-power landings, mentioned previously.

▶ **Reynolds Number Data** — Further doubts concerning the low-speed stability of delta-wing planforms are expressed on the basis of adverse Reynolds number effects.[23] An NACA study of captured German reports, together with Allied and U. S. data, indicate that although at low Reynolds numbers higher maximum lift coefficients were obtained for moderately swept-back wings than for unswept wings of similar planform, at high Reynolds numbers, however, increasing the sweepback decreased the maximum lift coefficients. The study showed this effect particularly marked for delta-wing planforms.

It was on the basis of these indications that the decision was made by the Air Force and Convair to delay the final design of the XF-92 until a flying scale model, the 7002, could be built and tested to provide high Reynolds number data.

▶ **Control Surfaces**—Problem of the location and planform of control surfaces on a delta-wing has undergone extensive theoretical and experimental study, but much remains to be done.

Use of delta-shaped control surfaces at the tips of the wing shows promise with one theoretical study indicating that for the same ratio of control surface chord to wing root chord, the triangular surface produced a rate-of-roll per hinge moment coefficient twice that of a two-dimensional case.[24]

For the case of a conventional full-span, constant-chord control, the results are not yet clear. Although the study indicated that the lift produced by a unit control deflection was actually greater than the lift resulting from a unit angle of attack of the entire wing, this is probably a result of the low lift curve slope of the wing, previously described, rather than control effectiveness.[25]

For the case of partial-span surfaces, either inboard or outboard, the variation of their effectiveness with Mach number leaves little to choose between the two, although the study indicates that high aspect ratio control surfaces have the same superior characteristics at supersonic speed as do those at subsonic speed.[26]

One of the interesting possibilities of providing camber and twist to a delta-wing to support specified lift distributions at supersonic speeds is the use of a gull-wing design, which was first revealed at the 1949 Inspection of the NACA Langley Aeronautical Laboratory.[27]

Whereas the flat-surfaced delta-wing has a U-shaped lift distribution when viewed in the plane of the wing, a flat distribution can be given by arching the plane of the wing upward and outward from the centerline. Various degrees of arch can be used to provide any required lift distribution. While these offer interesting theoretical possibilities, structural considerations make them impractical at this time.

References

1. Dailey, C. L. and Wood, F. C.: Computation Curves for Compressible Fluid Problems. John Wiley & Sons, Inc., New York.
2. USAF Reveals 3 New Supersonic Planes. AVIATION WEEK, Mar. 7, 1949.
3. Jones, Robert T.: Properties of Low-Aspect-Ratio Pointed Wings at Speeds Below and Above the Speed of Sound. NACA TN 1032, March, 1946.
4. Millikan, Clark B.: Aerodynamics of the Airplane. John Wiley and Sons, New York, 1941.
5. Ferri, Antonio: Elements of Aerodynamics of Supersonic Flows. The Macmillan Co., New York, 1949.
6. Jones, Robert T.: Estimated Lift-Drag Ratios at Supersonic Speed. NACA TN 1350, July, 1947.
7. Puckett, Allen E.: Supersonic Wave Drag of Thin Airfoils. Journal of Aeronautical Sciences, September, 1946.
8. Liepmann, H. W. and Puckett, A. E.: Introduction to Aerodynamics of a Compressible Fluid. John Wiley and Sons, New York, 1947.
9. von Kármán, Theodore: Supersonic Aerodynamics—Principles and Applications. Tenth Wright Brothers Lecture. Jour. Aero. Sc., July, 1947.
10. Beskin, Leon: Supersonic Characteristics of Triangular Wings. Paper delivered before 16th Annual Meeting, Inst. Aero. Sc., New York, Jan. 26-29, 1948.
11. Stewart, H. J.: Lift of a Delta Wing at Supersnic Speeds. Quarterly Appl. Math., October, 1946.
12. Ribner, Herbert S. and Malvestuto, Frank S., Jr.: Stability Derivatives of Triangular Wings at Supersonic Speeds. NACA TN 1572, May, 1948.
13. DeYoung, John: Theoretical Additional Span Loading Characteristics of Wings with Arbitrary Sweep, Aspect Ratio and Taper Ratio. NACA TN 1491, December, 1947.
14. Thirty-Fourth Annual Report of the National Advisory Committee for Aeronautics, March, 1949.
15. Soulé, Hartley A.: Influence of Large Amounts of Wing Sweep on Stability and Control Problems of Aircraft. NACA TN 1088, June, 1946.
16. Maggin, Bernard and Bennett, Charles V.: Low-Speed Stability and Damping-in-Roll Characteristics of Some Highly Swept Wings. NACA TN 1286, May, 1947.
17. Shortal, Joseph A. and Maggin, Bernard: Effect of Sweepback and Aspect Ratio on Longitudinal Stability Characteristics of Wings at Low Speeds. NACA TN 1093, July, 1946.
18. Toll, Thomas A. and Queijo, M. J.: Approximate Relations and Charts for Low-Speed Stability Derivatives of Swept Wings. NACA TN 1581, May, 1948.
19. Smelt, R.: A Critical Review of German Research on High-Speed Airflow. Journal of Royal Aeronautic Society, December, 1946.
20. Lange/Wacke: Test Report on Three-

and Six-Component Measurements on a Series of Tapered Wings of Small Aspect Ratio. (Partial Report: Elliptic Wing). NACA TM 1146, June, 1947.

21. Lange/Wacke: Test Report on Three- and Six-Component Measurements on a Series of Tapered Wings of Small Aspect Ratio. (Partial Report: Triangular Wing). NACA TM 1176, May, 1948.

22. Wick, Bradford H.: Chordwise and Spanwise Loadings Measured at Low Speed on a Triangular Wing. NACA TN 1650, June, 1948.

23. Thirty-Third Annual Report of the National Advisory Committee for Aeronautics, February, 1948.

24. Tucker, Warren A.: Characteristics of Thin Triangular Wings with Triangular-Tip Control Surfaces at Supersonic Speeds. NACA TN 1600, May, 1948.

25. Tucker, Warren A.: Characteristics of Thin Triangular Wings with Constant-Chord Full-Span Control Surfaces at Supersonic Speeds. NACA TN 1601, July, 1948.

26. Tucker, Warren A. and Nelson, Robert L.: Characteristics of Thin Triangular Wings with Constant-Chord Partial-Span Control Surfaces at Supersonic Speeds. NACA TN 1660, July, 1948.

27. Baldwin, Barrett S., Jr.: Triangular Wings Cambered and Twisted to Support Specified Distributions of Lift at Supersonic Speeds. NACA TN 1816, February, 1949.

Study Corrosion In Rocket Engines

Causes of corrosion in rocket engines are currently being investigated in a program initiated by the Engineering Division of the Air Materiel Command in cooperation with Reaction Motors, Inc.

Guinea pig in present investigation is the Air Force XLR11-RM-1 rocket engine.

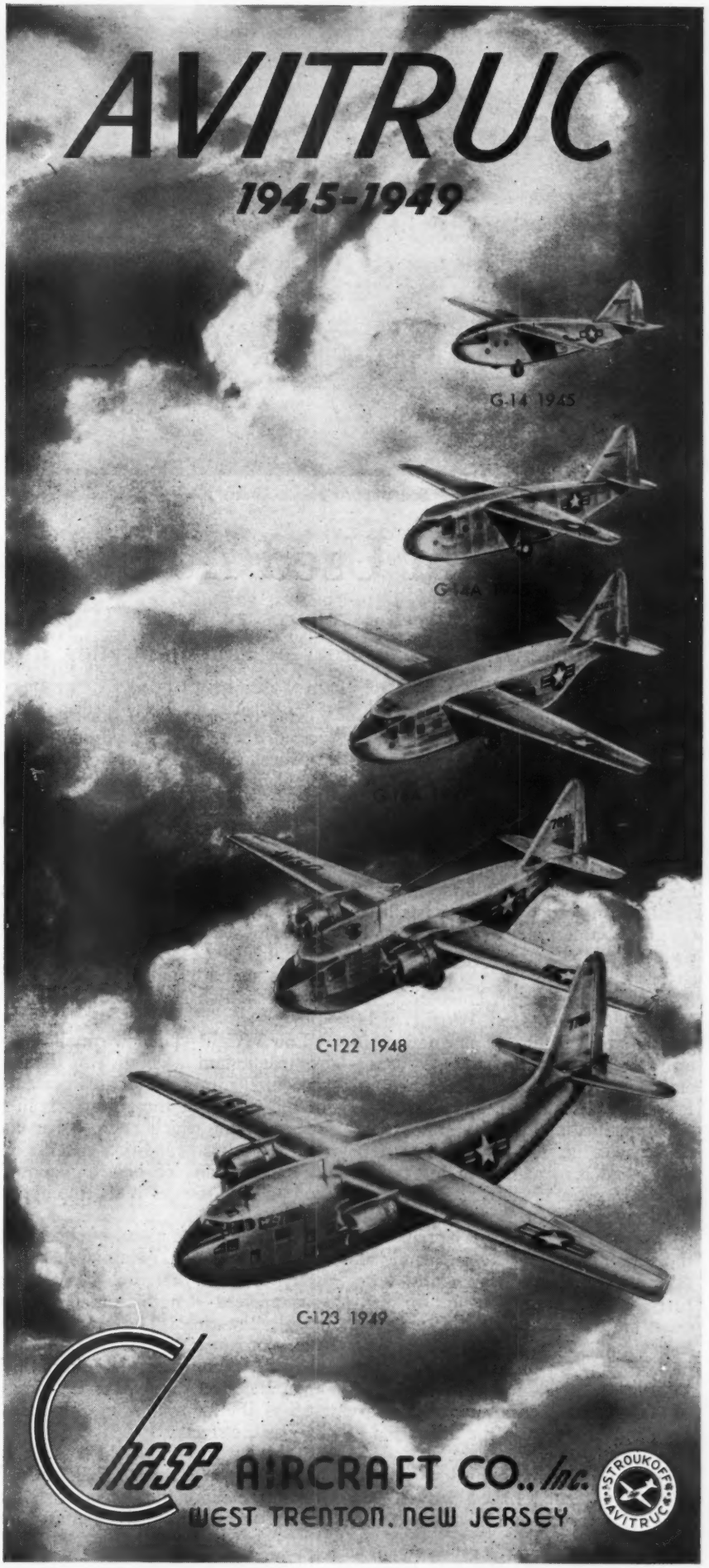
Components showing indications of corrosion are orifice and screen assemblies; porous strainers; pressure switches; general control, propellant and check valves; sparkplug bleed lines; tubing; and cylinders.

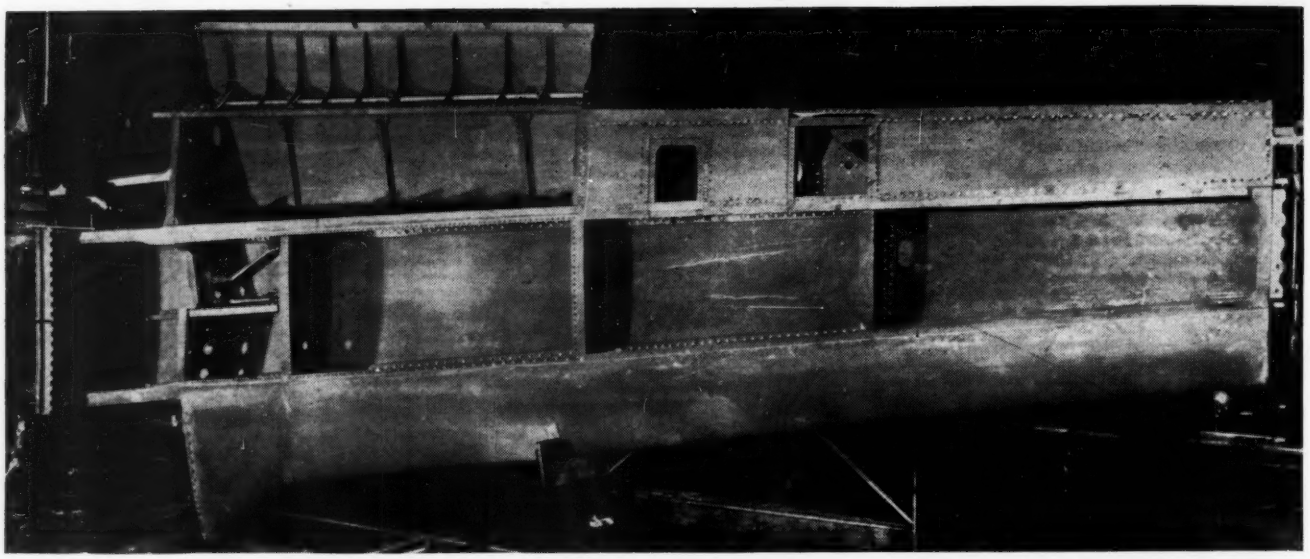
Study has shown that use of carbon tetrachloride for cleaning in the field is one reason for corrosion. Reaction Motors found that many corrosion problems were eliminated by discontinuing the use of this cleaning fluid at the plant.

Investigation has disclosed that corrosion occurs in component parts of rocket engines where fuel has become trapped. Parts mainly affected have been pressure control switches, fuel-inlet check valves, and igniters.

It has been determined that this problem is helped considerably by using inhibitors in fuel and by purging rocket engines with nitrogen gas after each firing, to dry out entire fuel system.

Another reason for corrosion may be use of regular tap water in the alcohol-water mixture used for fuel. Laboratory tests now are being made to investigate this condition. However, major factor is believed to be electrolytic action at contact points of dissimilar metals in the presence of the water-alcohol mixture, both in the liquid and in the vapor phase.





MAGNESIUM ALLOY construction applied to Lockheed F-80 wing panel indicates design simplicity attainable. By comparison . . .

Magnesium Used As Structural Material

Redesigned F-80 wing reduces pieces to 31 percent and fasteners to 38 percent of aluminum alloy wing.

By J. P. Donald Garges*

The effort to obtain universal recognition of magnesium as a primary material in aircraft construction is nearing an end.

The metal has been successfully used as a skin material many times, but largely due to lack of full understanding of all its properties it seldom has been considered as a primary structural material. But that situation shortly may be changed.

In April, the Aircraft Laboratory, Air Materiel Command, at Wright Field, gave approval for use of magnesium in primary structures for all types of aircraft, including high speed fighters. Previously it was an approved basic structural medium only for trainer types. This paves the way for the final step: design and construction of magnesium alloy service test aircraft.

Ultimate weight savings in use of magnesium are not substantial. But there are other pluses: aerodynamic advantages from thick wing skins; fewer parts, with resultant savings in man-hours and fabricating time.

► **New and Growing**—The use of magnesium alloys in primary aircraft structures is a relatively recent development. We at East Coast Aeronautics have been indoctrinated in the utilization of this material during our design and development of magnesium alloy wings for the F-80 airplane for the USAF Air Materiel Command. A similar project involving the design of a thick skin magnesium alloy wing for a jet fighter being produced for the U. S. Navy, Bureau of Aeronautics, under contract has given us further experience.

Magnesium is in a state of rapid development. The magnesium wing for the F-80 and the Navy fighter incorporates improved materials and techniques previously not in general use. An example is the employment of the new zirconium alloy (ZK-60) having greatly improved strength and ductility and with a notch-insensitivity comparable to 14ST.

► **Low Weight**—The low specific weight of magnesium accounts for its chief structural advantage. A high percentage of the weight of the airframe is in the members for which compressive buckling is a critical condition and the most effective means of boosting allowable compressive stresses is to employ thick cross-sections.

Consider three pieces of sheet metal: (1) magnesium, (2) aluminum, and (3) steel. Assume that each has the same unsupported length and that each weighs the same. The magnesium will be approximately 50 percent thicker than the aluminum and 4½ times thicker than the steel. It will be 2.5 times as stiff as the aluminum and 18 times as stiff as the steel.

This low specific weight is particularly interesting in practical design as a factor in the elimination of sheet stiffeners and formers and thereby permits simplification of the structure.

► **Disadvantages**—The magnesium alloys are at some disadvantage when compared to alloys of aluminum and steel on the basis of shear strength. This must be recognized in detail design by providing more liberal margins or edge distances around holes for fastenings.

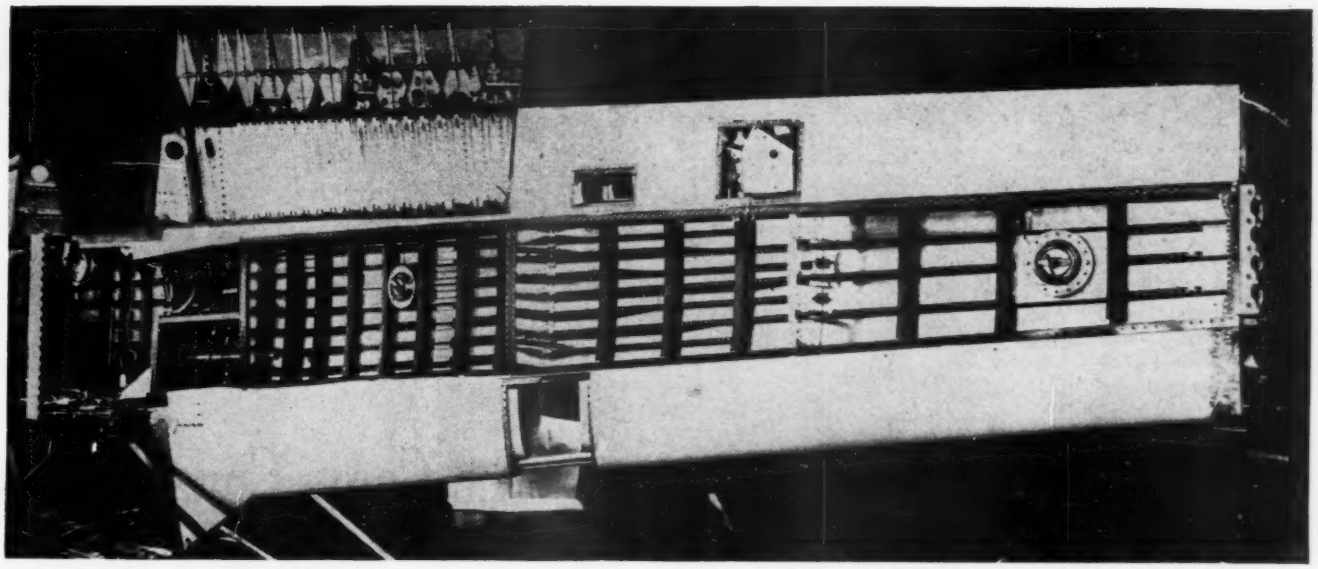
Another structural disadvantage of many of the magnesium alloys that must be given consideration is its notch-sensitivity. Poor notch-sensitivity is particularly associated with castings and extrusions that have been both heat-treated and aged. Unless a structural member is of such shape as to be notably free of stress concentrations it is well to make some sacrifice in high yield strength in the selection of a suitable alloy and heat treatment.

► **Fabrication**—Fabrication of any new structural material cannot properly be considered apart from design technique. The designer must have a full appreciation of the peculiarities of the material in relation to conventional methods of fabrication. The shop must also be familiar with the advantages and limitations of the material and must apply imagination to the development of new tools and techniques.

Practical men have often resisted the introduction of new structural materials and tended to exaggerate the difficulties encountered in their fabrication. The cost of early all-metal airplanes was excessive in comparison to contemporary wood construction. On the other hand, during World War II when wood construction had become a lost art, it was a costly operation to revert to wood as a substitute for scarce metal.

In design for fabrication, hard magnesium alloy sheet has the same limitations as any strain-hardened material. It cannot be stamped out to intricate shapes in the soft condition and then

*Chief Engineer, East Coast Aeronautics, Inc., New York City.



. . . ALUMINUM ALLOY makeup for similar panel uses relatively thin sheets stiffened by T-stringers and chordwise H-members.

made strong by heat-treatment. If a bending or mild forming operation can be done quickly, it is practical to use heat to increase the workability of the material. This can be accomplished with small sacrifice in strength.

► **Heat Effects**—If, however, a considerable amount of forming must be done, such as a deep-drawn operation, it is necessary to resort to prolonged heating and the fabricated part will have the strength properties of annealed material.

Accompanying graph shows the effect of annealing time and temperature on the room temperature properties of FS-1h sheet. These curves were obtained by tests on typical sheet, but due to limited test data they are intended to indicate heat effect only and are not to be considered as typical or minimum values. The permissible forming temperature is limited to that which will not result in more than permissible property loss. Some operations lend themselves to rapid forming and in such cases where time as well as temperature maximums can be accurately controlled, higher temperatures can be permitted.

Where extruded ZK-60 or ZK-60A is required to be bent, temperatures up to 500 F. can be used so long as the time is kept to within 5 minutes duration. Usually a temperature of 300 to 350 F. is sufficient for satisfactory bend operations of large sections such as the F-80 front beam caps so that no appreciable reduction in allowable strength need be expected.

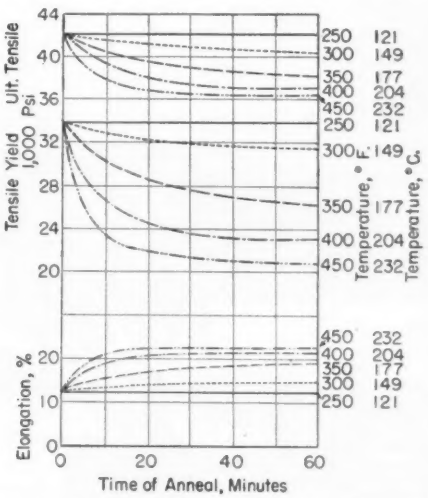
► **Available Gauges**—Another limitation common to all strain-hardened sheet is that it cannot be produced in extremely heavy gauges. Strong magnesium alloy is ordinarily available in the full hard temper in gauges up to about .1875 in. However, if extreme flatness is not required, hard sheets can be produced up to a thickness of about .375 in. Where a sheet is to be bent to the contour of a wing or to a cylindrical or conic shape, it obviously is not necessary to start with perfect flatness.

Magnesium alloys show a particular fabrication advantage in the ease with which they can be machined. Deeper cuts can be made than with other structural metals and smooth finish is more easily accomplished.

► **Casting**—Magnesium alloy castings have several important advantages in relation to design and fabrication:

• **A considerable backlog** of experience in foundry practice to produce reliable magnesium alloy castings.

• **Shapes can be cast** in magnesium alloy that are difficult or impossible with the strongest aluminum alloy casting alloys. On our design of a thick skin aluminum alloy wing for the F-80 we attempted to get an aluminum casting for station "O" bulkhead, but after many weeks of effort one of the foremost aluminum foundries reported they were unable to obtain an acceptable casting in either AN-A-33-3 (220-T) or AN-A-35 (195-T6). It was therefore necessary to obtain approval from AMC to use a magnesium casting.



Effect of anneal time and temperature on room-temperature properties of FS-1h sheet.

• **Low specific gravity** of magnesium permits use of thicker sections so that parts which must be intricate stampings in aluminum alloy may be castings in a magnesium design.

• **A strong magnesium alloy** casting has about 80 percent of the ultimate tensile strength of wrought magnesium alloy, but in the aluminum alloys this ratio is less than 60 percent.

• **Extensive peace-time use** of cast magnesium as compared to the wrought form has an important bearing on the question of facilities during a national emergency.

► **F-80 Wing**—Our recent F-80 project is an example of the design possibilities of magnesium alloy structures.

In approaching the problem of designing the F-80 wing in magnesium alloy it was felt that the material's low specific gravity should be exploited as a means of following a thick-skin type of structure with all stringers and sheet stiffening omitted. In this way a simpler, more rugged design would result at no appreciable weight penalty. The Lockheed design distributes the bending loads in about the following proportions: beam caps, 66 percent; skin (sheets and stringers), 34 percent.

However, with our thick-skin design we distribute these bending loads in the opposite manner: beam caps, 34 percent; skin (sheet alone), 66 percent.

A maximum skin thickness of .375 in. is used in place of a maximum thickness in the case of the Lockheed wing of .051.

The beam webs also follow this thick-skin procedure detail with consequent saving in vertical stiffeners, since the thicker web is more shear-resistant than the thinner aluminum alloy one.

The Cargo Constellation

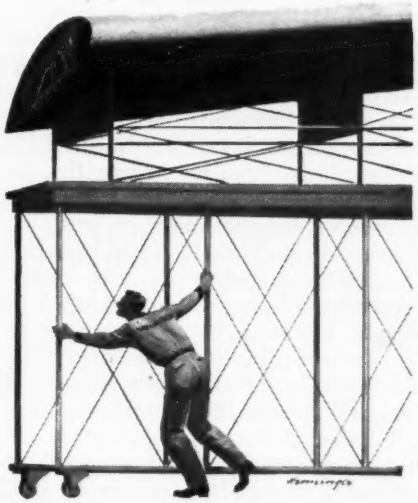
...an airplane with a world of experience

For more than six years, Lockheed Constellations have been steadily rolling off the production line. New orders, and re-orders, by leading airlines and governments of the world continue to tell its success story. This tried and proven Constellation also is available as a Medium Cargo Transport—the only medium cargo plane that is ready for delivery *this* year.

Lockheed

LOOK TO LOCKHEED FOR LEADERSHIP

© 1949, LOCKHEED AIRCRAFT CORP., BURBANK, CALIF.



Wing station 0 bulkhead, fabricated as one-piece magnesium casting, was substituted for built-up member consisting of 25 parts, 653 fastenings, with small weight penalty.

▶ **Changes With Magnesium**—The Station "0" bulkhead (which is the most heavily loaded bulkhead and located on the centerline of the wing and airplane) was originally of built-up design consisting of 25 separate pieces and 653 fastenings to hold the pieces together.

We were able to redesign this member as a one-piece magnesium casting, thereby eliminating 24 parts and 653 fastenings with only a very small weight penalty. The next bulkhead outboard, station No. 32-34 was also changed from its original built-up form to a one-piece magnesium casting, thereby eliminating 16 pieces and 180 fastenings.

The original aluminum alloy wing consists of approximately 1640 pieces and 42,700 fastenings. In the magnesium alloy design we have only 508 pieces and 16,000 fastenings. In other words, this simplified design contained only 31 percent the number of pieces and 38 percent the number of fastenings as the original aluminum alloy design.

It is reasonable to assume that the resultant saving in manhours to fabricate and assemble should follow approximately the same proportions for an equivalent number of units.

▶ **Tooling and Engineering**—With such an appreciable saving in the number of both parts and fastenings there is a noticeable reduction in the number and type of tooling required. Since care was taken to avoid intricate forming, there were no requirements for complicated heated dies.

An appreciable saving in number of drawings resulted from the simplification of the structure. Drawing release procedures, blue print release and control and filing procedures also were simplified by the saving in parts required.

Although the F-80 magnesium wing design may not necessarily set the pattern for all similar projects, we believe it represents a more or less typical example for that general category.

▶ **Skins and Webs**—The real advantage to be gained from the use of magnesium is in the skin covering and beam and rib webs. Here the designer can appreciably economize on parts and fastenings and at the same time create a simple, rugged structure.

Thick wing skins present valuable aerodynamic advantages in maintaining the wing contours of high Mach number aircraft. During static test of the F-80 magnesium wing, the skin did not buckle until well above the flight operating range. The additonal fact that the thicker skins generally result in smoother surfaces than are possible with the more conventional skin gauges also favors the aerodynamic efficiency.

With thick skins, such as were used on the F-80 project, (.375 inboard to .064 in the region aft of the rear beam in the vicinity of the aileron) no dimpling was required for flush rivets, machine countersinking being possible throughout. This simplified the problem of tooling, as well as of quality control, insofar as rivet flushness was concerned.

The maintenance picture with thick skin wing also is noticeably improved by providing rugged exterior surfaces which will permit rough handling in the field, as well as the elimination of cracks around rivets due to flexibility. The thick skins and more rugged exteriors often pay off during minor crashes such as ground loops and taxiing accidents by preventing damage to the generally vulnerable wings of the more fragile type of structure.

▶ **Beam Caps**—In the design of beam caps, conventional aircraft design techniques are followed. By means of the newer zirconium-magnesium alloy (ZK-60), which is available in the extruded form, good allowable strengths are obtained with greatly improved notch

characteristics. In this latter respect ZK-60 notch insensitivity is much superior to 75ST and approximately the same as 14ST.

Where bends of the cap may be required, local applications of heat within limits of time and temperature will permit this operation without appreciably affecting the physicals.

In the F-80 project, the beam caps are continued from tip to tip and must therefore be bent, after machining, for dihedral and in the case of the front beam for both sweep back and dihedral. Local applications of 350 F. for 5 minutes prepares the cap for the bending operation which is done on an arbor-press.

▶ **Ribs and Bulkheads**—In order to preclude the necessity of heated dies, as well as the doubtful physical properties of partially annealed magnesium alloy, intricately formed sheet metal parts were avoided. The ribs and bulkheads, with the exception of those adaptable to castings, were designed for built-up construction and consisted of web and extruded caps of more or less conventional type.

Here, as in the case of the beams, use of the heavier gauges for web material permitted fewer vertical stiffeners with a resultant economy in number of individual parts.

▶ **Fastenings**—In order to simplify finishing procedures and to prevent corrosion, 56S aluminum alloy rivets were used throughout the design. In cases where a shortage of this rivet was encountered it was permissible to use other aluminum alloys, provided that they were dipped in zinc chromate primer at the time of riveting.

In some installations use was made of 75ST Huck bolts where driving of the larger size 56S rivets became difficult or where the smaller diameter of the Huck bolt was desired because of the limited cap area available.

▶ **Composite Structures**—Our F-80 project required that we exploit magnesium alloy to the limit because of its non-strategic importance. Where this requirement is not paramount, the designer may wish to use a composite type of structure, using magnesium alloy where it will contribute most and aluminum alloy where it will be most effective.

From the previous discussion it would seem that 75ST or 14ST extrusions would be advantageous for beam caps and heavily loaded rib caps, and magnesium alloy used for skin covering and for beam and rib webs. However, it would be advisable to investigate the structural behavior of the composite structure in order to arrive at satisfactory parameters for such a design.

▶ **Additional Components** — Components in addition to the wing which are adaptable to magnesium alloy design are:

- **Wing Tips**
- **Ailerons**
- **Flaps**
- **Fuselage**
- **Empennage**
- **Landing gear doors**
- **Miscellaneous fairings** and fixed equipment items.

In the design of wing tips, hot forming, deep drawing and possibly welding are likely to be utilized. The very favorable forming properties of magnesium at elevated temperatures will be appreciated by the shop and no special difficulties should be anticipated in either the design or fabrication of this item.

The all-magnesium alloy flap or aileron design could profitably employ heavier sheet gauges. For the same weight per square foot, magnesium skin may be 50 percent thicker and 150 percent stiffer than aluminum alloy similarly supported. The resultant structure will have considerably fewer parts because the thicker sections will require a less elaborate system of stiffening.

It is suggested that the designer avoid intricately formed sheet metal parts in order to preclude the expense of hot-forming as well as the doubtful physical properties of the partially annealed magnesium alloy.

In the design of a magnesium alloy fuselage structure, the low specific gravity of magnesium will permit the use of substantially thicker skin gauges and reduce the number of longitudinal stiffeners and frames.

Magnesium structures for stabilizer, fin, elevators and rudders could follow in general the design technique discussed for the wing, ailerons and flap, that is, thick skins and a simplified structure.

▶ **Caution Needed**—the usual caution followed during the introduction of any new material or design technique must certainly be exercised when designing magnesium alloy aircraft structures.

However, if care is taken to consider existing shop equipment and production techniques in the original design, it will be found that the transition period in changing production from aluminum alloy to magnesium alloy components is a short and comparatively painless one.

By exploiting the low specific gravity of magnesium to permit heavier gauges and the elimination or reduction of stiffeners, ribs and frames many manhours can be saved in Engineering, Tooling and Manufacturing and at the same time a simpler, more rugged structure will be produced at a surprisingly low weight.

Advantages Claimed for Silver-Zinc Cell

A lightweight, rechargeable silver-zinc cell, which uses an alkaline electrolyte, exhibits interesting potential as an aircraft battery element.

It reportedly makes possible development of a battery ¼ as heavy as a lead cell unit having an equivalent rating.

Perfected by French physicist Henri Andre, who developed it to its present state, the cell is made in this country, under license, by Silvercell Corp., 50 Rockefeller Plaza, New York City.

According to the manufacturer, the cell already has been tested by one of the Services, which has placed an initial contract.

Although the silver-zinc cell is not new, it is claimed that the present unit is the first to be rechargeable.

The maker states that, in addition to small size and light weight, a battery incorporating the silver-zinc cell would have these advantages:

- Electrolyte is absorbed, not driven off, during charging.
- No danger of overcharging, since electrodes do not buckle.
- Freedom from corrosive acid fumes, and absence of leakage.
- Long shelf life.
- Mechanical ruggedness and resistance to shock and vibration.

The company believes that the higher cost of a silver-zinc battery would be offset by savings in weight and space.

It points out that the standard lead-acid storage battery, rated at 63 amp.-hr. and 12v., weighs 63 lb. and occupies 965 cu. in. It is claimed that an equivalent silver-zinc-cell battery, having the same amp.-hr. capacity and voltage, would occupy 400 cu. in., weigh 16 lb.

Oil Foaming Reduced By Charcoal Column

A step toward eliminating oil foaming in engines has been achieved through experiments conducted at Stamford University, according to a report prepared for the National Advisory Committee for Aeronautics, and announced by U. S. Dept. of Commerce office of technical services.

An old problem in the operation of internal combustion engines, foaming impedes oil circulation, reduces lubricating efficiency.

Experiments, financed by NACA, showed that oil can be successfully defoamed by recycling through a column of activated charcoal.

An aircraft-type lubricating oil was recycled through the column at 50 C.

or lower, then circulated through engine at 100 C. It produced only 1/10 the volume of foam as compared to untreated oil.

Activated magnesium oxide, silica gel and Porocell, when packed in columns for recycling, also defoamed oil, but not to same extent.

Extraction of oil with liquid sulfur dioxide, phenol or aqueous sodium hydroxide failed to produce any significent change in tendency to foam.

Use of finely divided sodium chloride, followed by filtration, also was unsuccessful.

Despite success of the charcoal defoaming method, little is known concerning the nature of the action, or the constituents responsible for foaming. The report recommends further studies on the subject.

Technical Note 1845, on this subject, titled "Attempts to Defoam Existing Oils by Processing," may be obtained from NACA.

Sight-Saving Program Aids Plant Workers

An eye-safety program started in leading industrial firms during the past two years is paying big dividends, according to the American Optical Co.

Over 2,000,000 workers—ten percent of the nation's industrial force—now are benefiting from this program, which has been aided by American Optical's development of a portable sight-screening instrument.

The instrument can be utilized anywhere in the plant by ophthalmologists or optometrists in charge of program, to check 14 important visual functions in a few minutes.

If the check indicates need for visual care, workers are urged by companies to seek professional attention to bring vision to highest possible level. Those on eye-hazardous jobs are provided with safety goggles, and if vision is deficient, with prescription goggles.

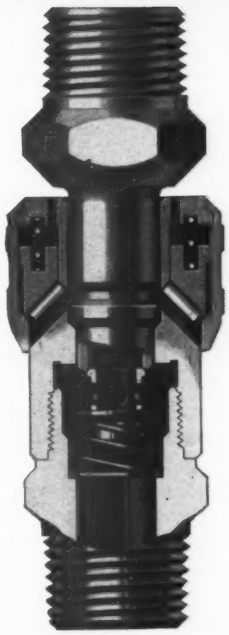
Program also features establishment of eye-protection standards, checks to insure that protective devices are properly fitted and kept in good condition, and recommendations for improvement of environmental conditions affecting vision, such as correct illumination and elimination of glare.

Practically every type of industry has adopted the new safety and visual efficiency program, including plants in the metal working, textile, chemical, oil, transportation equipment, public utility and other fields.

Recent reports from plants revealed that, on the average, one out of every three factory workers needed eyesight correction. It's reported that program has greatly reduced eye accidents.

with HANSEN couplings

minutes Saved are HOURS GAINED



CONNECTION

TAKES ONLY A SECOND

If you have fluid lines in your plant you can increase efficiency and save precious minutes with Hansen Couplings. Any line can be quickly and easily connected or disconnected without loss of liquid or gas in the line.

When you want to connect a Hansen Coupling, it is merely necessary to push the plug into place, where it locks securely. The valve opens, and flow starts instantly. The same operation disconnects—move the sleeve, and the plug pops out. Flow is shut off automatically.

From a wide range of available sizes and types you can select one suitable for any application. Air, oil, and gas, oxygen and acetylene, gasoline, hydraulic oil, and steam . . . each type of service has a Hansen Coupling engineered to meet its specific requirements.

Write for Industrial Catalog No. 47 today.

QUICK-CONNECTIVE COUPLINGS

for AIR • ACETYLENE • OIL • GASES

GREASES • STEAM • OXYGEN • HYDRAULIC

REPRESENTATIVES

New England States: Pearse-Pearson Co., West Hartford, Connecticut, Boston, Massachusetts
Atlantic, Gulf States: B-R Engineering Co., Baltimore, Md.
Northern Ohio: F. & W. Ursem Company, Cleveland, Ohio
Southern Ohio, W. Va., Northeastern Ky.: Steinhagen Airline Products, Dayton, Ohio
Tennessee, Arkansas, Kentucky: Ralph A. Hiller Co., Nashville, Tennessee
Michigan: William H. Nash Company, Detroit, Michigan
Indiana, Wisconsin: Neff Engineering Company, Ft. Wayne, Indiana, Milwaukee, Wisconsin
Northern Illinois, Eastern Iowa: Walter Norris Engineering Company, Chicago, Ill.
Central Midwestern States: Sturgis Equipment Co., St. Louis, Mo.
North Midwestern States: Hanscome-Rogness Company, Minneapolis, Minnesota
Texas, Oklahoma: C. C. Brownfield Dallas, Texas
Colorado, New Mexico, Utah, Wyoming: E. C. Wild Co., Denver, Colorado
Northern Cal., Nevada: R. J. Gentles, San Francisco, California
Arizona, S. California: Chester Paul Co., Glendale, California
Idaho, Oregon, Washington: Jack J. Kolberg Company, Seattle, Wash.

IN CANADA

Province of Ontario: John Best Associates, Toronto, Ontario
Quebec & Maritime Provinces: Cowper Company Ltd., Montreal, Que.

THE HANSEN MANUFACTURING COMPANY

4031 WEST 150th STREET • CLEVELAND 11, OHIO

PRODUCTION

Formula for Export Plane Sales

Beech export manager, after European survey, calls for aggressiveness, follow-up, service and financing.

The dollar shortage isn't the only reason more U. S. aircraft are not being sold in Europe. A seasoned aircraft export manager recently returned from Europe says flatly that sales can be made by American aircraft manufacturers—but in some cases they have to change their tactics.

According to E. S. Safford, export sales manager of Beech Aircraft Corp., here's what U. S. aircraft salesmen have to do:

- **Be more aggressive.**
- **Provide constant follow-up.**
- **Offer additional services.**
- **Arrange for financing** and servicing of the equipment.

Accessory manufacturers and surplus dealers have done and continue to do a very impressive job. But, Safford tells AVIATION WEEK, "In my talks with aviation people in Europe and Scandinavia, I found that U. S. aircraft manufacturers as a whole have not been too aggressive in attempting to develop markets in those areas since the war.

"While certain U. S. manufacturers have representation in Europe, few have sent factory representatives into those areas for on the spot sales work, either directly or in conjunction with distributor organizations."

▶ **Dollars Still Problem**—Safford does not mean that the trouble is all with the manufacturers. There are high duties, import restrictions and availability of surplus planes. The dollar shortage is still acute and the underlying difficulty, despite the wholesome effect of Marshall Plan aid.

ECA has had a tremendous influence in Europe, Safford says, and few Americans who have not had the opportunity of personally seeing the results "can fully appreciate the effect this program has had not only on the economy of Europe, but in the general economic health of the entire capitalistic system of the world."

▶ **National Pride**—In great part due to the Marshall Plan, the general economic condition of Europe is better than the Beech representative expected. Europe is recovering, and that brings another competitive problem. It is national pride.

U. S. business men abroad generally have found that most European nations would prefer to buy and sell among themselves because of a closer community of interest. European aircraft firms now are getting back into production and have their own products to offer. Here's how Safford views that competitive angle:

▶ **No Personal Market**—"Major markets for aircraft products in Europe are the airlines and the military establishments. Most aircraft industries now operating in Europe are geared principally for military or airline production. Very little emphasis has been put on the personal market due principally to the fact that this market has not come back in Europe since the end of the war.

"Apparently the fact that the British and French industries have been nationalized has to a certain degree handicapped their efforts and neither country has produced many aircraft that can be considered competitive to American products. There are, of course, exceptions such as the de Havilland Vampire, which is extremely popular throughout Europe."

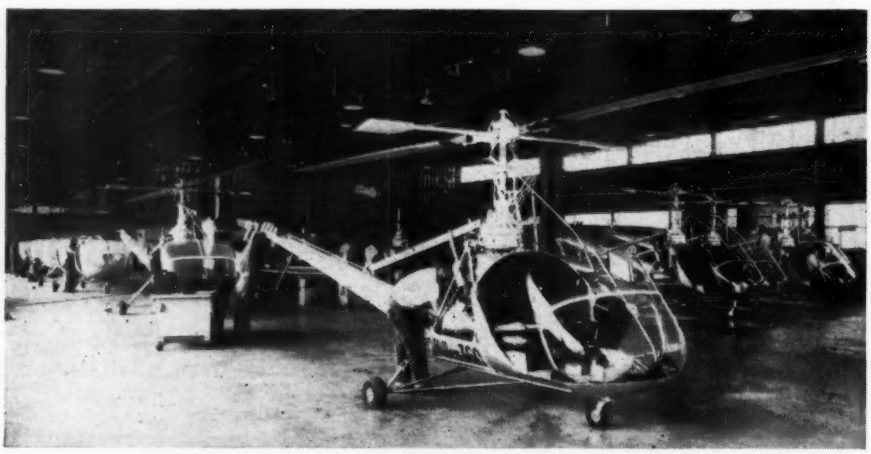
▶ **Cost Factor**—U. S. manufacturers have a big plus in their sales efforts abroad: lower price due to greater unit volume. Safford puts it this way: "The industries in the smaller countries, such as Holland and Switzerland, are handicapped by lack of production volume which can be anticipated for any one model. Result is that even when good designs are developed, the per unit cost of production become almost prohibitive.

"The only advantage such manufacturing provides is acquisition of aircraft with local funds, plus the security which a local industry provides as a source of supply. From my discussions I believe that these countries will welcome a military equipment standardization program such as the Atlantic Pact will offer, as this should mean a considerable reduction of the per unit cost of aircraft."

▶ **New Thought**—But if U. S. aircraft are going to be provided under the Pact, Safford thinks the conventional procedure of nation-to-nation dealing should be changed. His proposal: manufacturers should be permitted to negotiate with the individual nations. He thinks it could be done, without upsetting standardization plans, under a formula to insure interchangeability of parts and equipment.

This idea, Safford thinks, has two great advantages: it "could relieve the Air Force of complex administrative and procurement problems;" and it would "preserve the individual dignity of the respective participating air forces by permitting them to handle their own negotiations, rather than carrying on such negotiations through the procuring agency of another country's air force."

Overall costs would be about the same, Safford says, and the arrangement would be better as it would enable direct factory training of service personnel provided by factory-user negotiations.



COPTER PRODUCTION LINE

United Helicopters, Inc., production line, now turning out three Hiller 360s a week, is shown at the company's Palo Alto, Calif., plant. The craft sells for $19,995. Palo Alto plant employes over 125 persons. Nearly 92 percent of the copter is subcontracted.

Union Rivalry

Seeking jurisdiction over Boeing Airplane Co.'s 18,000 workers at Seattle, Wash., the two principal unions involved each have 14 organizers working 24 hours a day to prepare for National Labor Relations Board election.

The organizers have virtually free access to the plant under arrangements with the company, which also has set up a schedule preventing representatives of both unions being in any one department at the same time.

Not more than one organizer is permitted in any department at one time and none are permitted to issue handbills or other written material. The organizer usually talks with one worker at a time but, in cases where taking one man off a job would stop an entire group, he is allowed to talk to the group, usually three or four employes.

The campaign is between District 751, Aeronautical Mechanics, affiliated with the International Association of Machinists (independent), and Local 451, Aeronautical Workers, affiliated with the A. F. of L. and the Joint Council of Teamsters.

PRODUCTION BRIEFING

▶ **Air Associates, Inc.** has been appointed distributor for Tinnerman aircraft speed nuts and clips. Air Associates will handle Tinnerman products through its offices in Los Angeles, Dallas, Chicago and Teterboro, N. J.

▶ **Bendix Aviation Corp.**'s Pacific division has begun work on a new plant in North Hollywood, Calif. It will be used to make industrial hydraulic equipment.

▶ **General Electric Co.** has received an increase of undisclosed amount in its original $6.5 million USAF contract for aircraft fire control systems to be made at its Westover, N. Y. plant.

▶ **Hamilton Standard** division of United Aircraft Corp. will furnish a specially-tailored version of the 43E60 reversing Hydromatic propeller for the 20 new Lockheed Model 749 Constellations purchased by TWA.

▶ **Thompson Products, Inc.**, Cleveland, will get a license on the "frozen mercury process" for casting super-hard metals and intricate metal parts as part of its production program on rotors and turbine blades for aircraft jet engines. Process was developed by Everhard J. Kohl of Mercast Corp., Cleveland.

▶ **Wright Aeronautical Corp.** plant in Wood-Ridge, N. J., will be closed for an annual vacation period during the first two weeks in August.

▶ **De Havilland Aircraft Ltd.** of Toronto received a $500,000 order from the Egyptian Government for 24 Chipmunk training planes. Earlier this year the Indian government ordered 41 Chipmunks.

▶ **Crosley Motors,** Cincinnati, will use an adaptation of the Goodyear-Hawley aircraft disc brake on its midget cars. The Hydradisc brake will be built under license from Jesse G. Hawley of Corning, N. Y., who also licensed Goodyear to build this type of brake for aircraft.

▶ **AiResearch Aviation Service Co.**, at Los Angeles, now has a backlog of $400,000 in modification work on executive aircraft for Continental Oil Co. Thompson Products, Humble Oil and Signal Gas and Oil Co.

▶ **TEMCO**–Texas Engineering and Manufacturing Co.–Has designed a new three-piece canopy for its military type TE-1A tandem trainer. The new canopy is made of Plexiglas with a magnesium alloy frame.

▶ **Northrop Aircraft, Inc.** has arranged a new $5 million long term credit agreement with the Reconstruction Finance Corp. for the financing of future production work. Loan is expected to be liquidated within two years.

How Big Is the Propeller Industry?

First definite indication of the size of the aircraft propeller industry in the U. S. is given in a new report of the Bureau of the Census and the Civil Aeronautics Administration, covering the year 1948. Data for the table below were gathered by the Industry Division of the Census Bureau from 15 companies, all those known currently to be manufacturing propellers.

In December, 1948, these companies employed 10,485, divided between 7867 production and related workers, and 2618 other plant employes. Employment was relatively stable throughout the year, low being 9925 in March, and high, 10,553, in November.

Shipments of Propellers and Other Products—1948

(000's omitted)

	All products total	AIRCRAFT PROPELLERS AND PARTS							All other products
		Total	Military			Civil			
			Total	Propellers	Parts	Total	Propellers	No. Parts	
Jan.	$5,435	$2,761	$1,756	$1,482	$274	$1,003	$623	1,802 $382	$2,674
Feb.	5,699	3,450	2,597	2,025	572	853	493	1,638 360	2,249
Mar.	7,071	4,664	3,425	2,759	666	1,239	754	2,549 485	2,407
Apr.	7,055	4,314	3,048	2,498	550	1,266	786	2,557 480	2,741
May	7,496	5,085	3,987	3,122	865	1,098	759	2,523 339	2,411
June	7,421	4,733	3,616	2,670	946	1,117	770	2,573 347	2,688
July	7,152	3,938	3,015	1,939	1,076	923	711	2,091 212	3,214
Aug.	5,945	3,581	2,769	2,084	685	812	462	2,262 350	2,364
Sept.	6,893	4,190	3,153	2,145	1,008	1,037	520	1,888 517	2,703
Oct.	7,346	4,789	3,287	2,223	1,064	1,502	1,025	1,499 477	2,557
Nov.	7,335	4,685	3,586	2,588	998	1,099	742	889 357	2,650
Dec.	8,348	4,812	3,704	2,775	929	1,108	685	733 423	3,536
Totals	$83,196	$51,002	$37,943	$28,310	$9,633	$13,059	$8,330	23,004 $4,729	$32,194

WHO'S WHERE

Aeronca Aircraft Corp., Middletown, Ohio, elected two new directors and re-elected eight present members of the board. New members are Raymond Dadisman, former market development division manager of Armco Steel Corp., and T. W. Jones of Jones & Gilles, Washington, D. C.

Texas Engineering and Mfg. Co., Grand Prairie, Texas, appointed Wilhelm Bischoff superintendent of sheet metal fabrication and machine shop operations. Bischoff, wartime superintendent of sheet metal fabrication at the Kansas City plant of North American Aviation, Inc., sold his business, Slouson Aircraft Co., Los Angeles, to join TEMCO. Otto E. Witback was named general superintendent of factory operations. Witback, who has been with company since it started in 1945, also was formerly employed by North American Aviation.

Westinghouse Electric Corp., Pittsburgh, named L. E. Osborne staff supervisor of all firm's manufacturing activities. Osborne also retains operating responsibility for five manufacturing divisions. John K. Hodnette, vice-president in charge of Transformer division, became general manager of industrial products with headquarters in Pittsburgh.

Koppers Co., Inc., named J. L. Tunstead sales manager of Metal Products division, Baltimore. Tunstead is former general manager of Hearst Saturday Home Publications and was associated with Hearst in various capacities in Chicago and New York for 20 years. He succeeds McMillan Robinson who died last April.

Walter Kidde & Co. named E. D. Reddan manager of a new midwest aviation sales office in Dallas, Tex. Reddan was assistant manager of Kidde's aviation sales division at the main office in Belleville, N. J. John D. Hull, Jr., who managed the Kansas City office, now closed, assumes Reddan's job at Belleville.

Cleveland Pneumatic Tool Co., Cleveland, Ohio, appointed Elmer W. Krueger operations manager of entire company. Krueger, who has been with firm since 1922, was general manager of sales administration before his promotion. John M. Chapman was named to fill Krueger's old position. Chapman formerly was purchasing agent at Fairchild.

Republic Aviation Corp. appointed Robert S. Johnson liaison engineer in the military contracts division. Johnson formerly was with Republic and resigned more than a year ago to go into the export business.

Latest Air Force Bid Awards

Air Materiel Command procurement Division makes available to AVIATION WEEK the latest bid awards, shown on this page. Requests for further information should be addressed to Contracting Officer, ACM, Wright-Patterson AFB, Dayton, Ohio, attention: MCPPSX72, (AMC will resume in July, the issuance of data on invitations for bids.)

ABSTRACTS

For base, cable, & drum assemblies (49-1704):
Companies sharing—R. G. Dykeman Co., Dayton, on a bid of $69; Industrial Precision Products Co., Chicago, on a bid of $510; Alloy Mfg., Co., Chicago, on a bid of $1412; Franklin Machine Products Co., Inc., New York, on a bid of $1270; Dayton Centerless Grinding Co., Dayton, on a bid of $150; Blaking Co., Minneapolis, on a bid of $245.60; Acorn Tool & Mfg., Inc., Cincinnati, on a bid of $150, and Hawthorne Co., Kansas City, Mo., on a bid of $175.

For 60 chamber assemblies (49-1714):
B. F. Goodrich Co., Akron, on a bid of $33,300.

For cloth (49-1779):
Companies sharing—W. Harris Thurston, Inc., New York, on a bid of $32,750; Wellington Sears Co., New York, on a bid of $22,350, and Scotland Mills, Inc., Laurinburg, N. C., on a bid of $21,000.

For lamp assemblies (49-1795):
Grimes Mfg., Co., Urbana, O., on a bid of $37,699.45.

For fuel hose (49-1853):
Goodyear Tire & Rubber Co., Inc., Akron, on a bid of $22,400.

For copper sheets (49-1855):
Revere Copper & Brass Inc., Detroit, on a bid of $3476.15.

For aircraft testers (49-1868):
Companies sharing—Electric Heat Control Co., Cleveland, on a bid of $5098.95, and Watson Elevator Co., Inc., New York, on a bid of $4556.

For fire extinguisher charge (49-1885):
Mearl Corp., New York, on a bid of $237,132.25.

For bookcases (49-1889):
Globe-Wernicke Co., Washington, D. C., on a bid of $4815.

For steel tubing (49-1890):
Companies sharing—Ellwood Ivins Steel Tube Works, Inc., Philadelphia, on a bid of $7745.35; Peter A. Frasse & Co., Inc., New York, N. Y., on a bid of $5481.39.

For 274,964 gallons (49-1896):
United Distillers of America, Inc., New York, on a bid of $89,775.75.

For lacquer (49-1897):
Companies sharing—Indianapolis Varnish Co., Indianapolis, on a bid of $36,627.50; Atlas Powder Co., Industrial Finishes, North Chicago, Ill., on a bid of $8229.60; Lowe Brothers Co., Dayton, on a bid of $2575.20; Ferbert-Schorndorfer Co., Cleveland, on a bid of $23,043.12; Cook Paint & Varnish Co., Detroit, on a bid of $46,305.08, and Andrew Brown Co., Los Angeles, on a bid of $13,889.16.

For copper wire (49-1901):
United Wire & Supply Corp., Cranston, R. I., on a bid of $4850.12.

For 3904 fitting assemblies (49-1925):
Aeroquip Corp., Jackson, Mich., on a bid of $2810.88.

For acetylene hose (49-1953):
Boston Woven Hose & Rubber Co., Cambridge, Mass., on a bid of $5164.

For light assemblies (49-1980):
Grimes Mfg. Co., Urbana, O., on a bid of $7398.75.

For parachute assemblies (49-1546):
Companies sharing—General Textile Mills, Inc., New York, on a bid of $49,265.50; Switlik Parachute Co., Inc., Trenton, on a bid of $73,032; Pioneer Parachute Co., Inc., Manchester, Conn., on a bid of $16,002, and Aerial Machine & Tool Corp., Long Island, N. Y., on a bid of $19,200.

For oscilloscopes (49-1580):
Hughes-Peters, Inc., Dayton, on a bid of $3577.50.

For handle assemblies (49-1447):
Companies sharing—Adams Rite Mfg., Co., Glendale, on a bid of $7313; Dayton Mfg. Co., Dayton, on a bid of $900; and Hartwell Aviation Supply Co., Los Angeles, on a bid of $102.

For de-frosting fluid (49-1556):
Protective Treatments, Inc., Dayton, on a bid of $137,032.56.

For packing rings (49-1585):
Companies sharing—Anchor Rubbing Co., Dayton, on a bid of $6083.17, and Linear, Inc., Philadelphia, on a bid of $4593.85.

For fuel tanks (49-1596):
Fletcher Aviation Corp., Pasadena, on a bid of $586,277.22.

For photographic tape (49-1618):
Minnesota Mining & Mfg. Co., St. Paul, on a bid of $16,344.42.

For 500 base assemblies (49-1630):
Herschel White Foundry Co., Hillsboro, O., on a bid of $10,319.

For synthetic rubber sheets (49-1992):
Companies sharing—B. F. Goodrich Co., Akron, on a bid of $13,900; Hewitt Rubber Division, Hewitt-Robins, Inc., on a bid of $1526, and Armstrong Cork Co., Lancaster, Pa., on a bid of $300.

For batteries (49-2091):
Electric Storage Battery Co., Cleveland, on a bid of $84,260.33.

For crystal holders & electrodes (49-574):
Companies sharing—Bliley Electric Co., Erie, Pa., on a bid of $2068; Premier Crystal Laboratories, Inc., New York, on a bid of $3981; Reeves-Hoffman Corp., Carlisle, Pa., on a bid of $21,080, and Polytech Devices, Inc., Elizabeth, N. J., on a bid of $3500.

For terminal boards, filter assemblies, switches & motors (49-1600):
Companies sharing—Continental Electronics, Brooklyn, on a bid of $898; Standard Electrical Products Co., Dayton, on a bid of $818.25, and H. O. Boehme, Inc., New York, on a bid of $1953.20.

For plug connectors (49-1652):
Companies sharing—Continental Electronics, Brooklyn, on a bid of $4388.04, and Kings Electronics Co., Inc., Brooklyn, on a bid of $4751.25.

For silver wire solder (49-1745):
American Platium Works, Newark, N. J., on a bid of $17,292.50.

For pressboards (49-1762):
Companies sharing—Laurel Process Co., Inc., New York, on a bid of $50,000; Emerson Press, Inc., Pittsburgh, on a bid of $50,000, and Keller-Crescent Co., Evansville, on a bid of $50,000.

For ball bearings (49-1769):
Companies sharing—General Motors Corp., Bristol, Conn., on a bid of $2020, and Norma-Hoffmann Bearings Corp., Stamford, on a bid of $1501.

For towel machinery (49-1777):
Leshner Corp., Hamilton, O., on a bid of $7350.

For aluminum alloy-rods (49-1764):
Companies sharing—Manuel T. Fine & Co., Los Angeles, on a bid of $6096.87; Atlantic Steel & Iron Co., Springfield, Mass., on a bid of $2741.30, and Reynolds Metals Co., Louisville, on a bid of $1208.80.

For dolly & cradle assemblies (49-1794):
Rockwell Engineering Co., Blue Island, Ill., on a bid of $5236.

For aircraft starters (49-1816):
Bendix Aviation Corp., Teterboro, on a bid of $79,500.

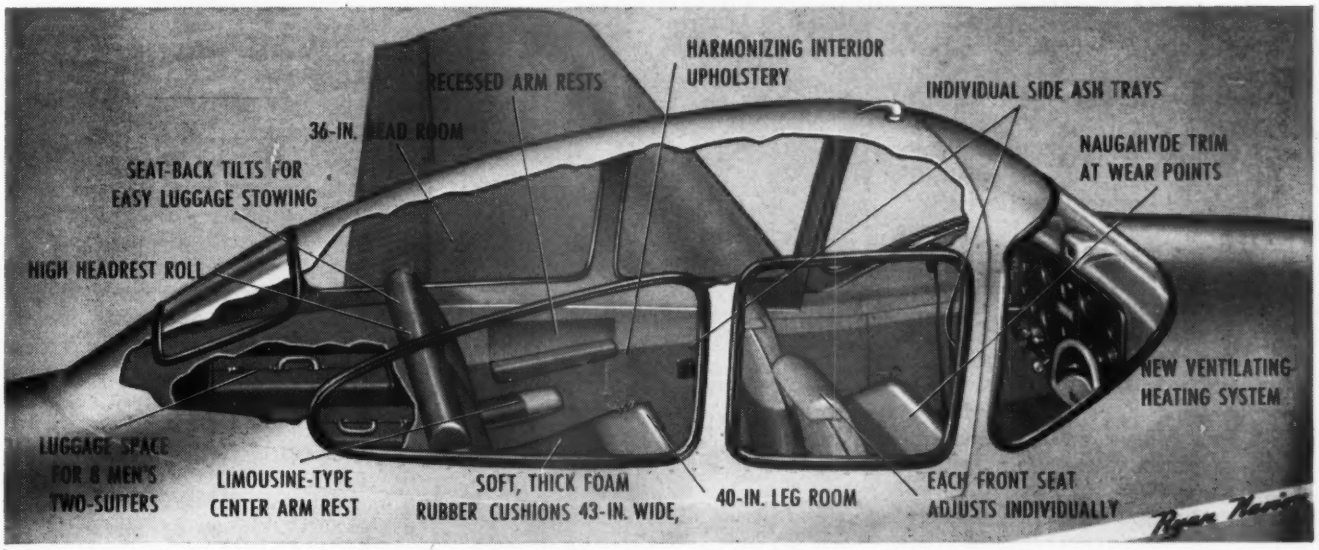
For 118 tester assemblies (49-1826):
Companies sharing—Aermotive Equipment Corp., Kansas City, Mo., on a bid of $6394.44, and Burton-Rogers Co., Cambridge, Mass., on a bid of $4600.

For cellulose dope (49-1845):
Andrew Brown Co., Los Angeles, on a bid of $6585.

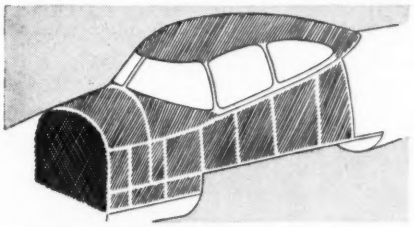
For photographic blotter (49-1865):
Mathers-Lamm Paper Co., Washington, D. C., on a bid of $5200.

For gasoline hose (49-1887):
Companies sharing—Quaker Rubber Corp., Philadelphia, on a bid of $5823.18; United States Rubber Co., New York, on a bid of $58,985.50; Metal Hose & Tubing Co., Dover, N. J., on a bid of $1606, and B. F. Goodrich Co., Akron, on a bid of $52,908.

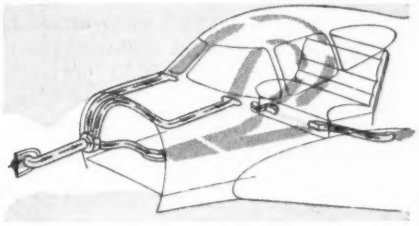
HERE'S WHY WE SAY RYAN NAVION GIVES YOU AIRLINER COMFORT


HARMONIZING INTERIOR UPHOLSTERY
RECESSED ARM RESTS
INDIVIDUAL SIDE ASH TRAYS
36-IN. HEAD ROOM
NAUGAHYDE TRIM AT WEAR POINTS
SEAT-BACK TILTS FOR EASY LUGGAGE STOWING
HIGH HEADREST ROLL
NEW VENTILATING-HEATING SYSTEM
LUGGAGE SPACE FOR 8 MEN'S TWO-SUITERS
LIMOUSINE-TYPE CENTER ARM REST
SOFT, THICK FOAM RUBBER CUSHIONS 43-IN. WIDE,
40-IN. LEG ROOM
EACH FRONT SEAT ADJUSTS INDIVIDUALLY

MOST OF ALL, "comfort" depends on confidence in the design, structural integrity and dependable performance of the airplane itself. And here, *Navion* stands alone... establishes a new standard for the personal-business plane because it is so rugged and easy-to-fly safely. Beyond this, the owner of a "family-size" airplane expects, and gets in *Navion*, actual riding comfort in the "airliner" luxury class. There's room to spare for four big people to stretch out in the deep-cushioned seats. Reliable VHF radio assures long-distance contact. Everything is as thoughtfully planned as in a fine custom-built town car. Just check each *Navion* comfort feature. Then compare!

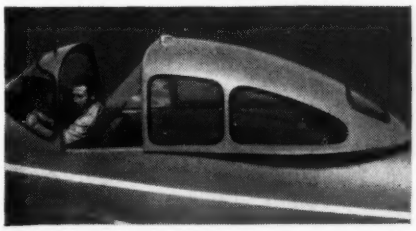


A THICK, "ALL-ROUND" blanket of sound insulation makes cabin amazingly quiet. Exhaust is muffled and discharged under wing. Thick windows and windshield repel noise.



PLENTY OF FRESH OR WARMED AIR is assured with *Navion's* new ventilation...draft-free, living-room comfort for every corner of the cabin. Heater is standard equipment.

BAGGAGE SPACE to spare—room for up to 180 lbs. in 20-cu. ft. luggage compartment. Want to carry bulky loads? Remove 3 seats and *Navion* will handle full ½-ton cargo.



ENTRANCE AND EXIT for all passengers is made easier with *Navion's* exclusive roll-back canopy which opens full 2½-ft. There's room for passengers to change seats safely in flight.

THE EASY, RELAXING way to fly! *Navion* features "two-control after take-off," literally flies itself over long periods. Yet, you have rudder for landings and take-offs.

SMOOTH, "IN THE GROOVE" flying, even in rough air. Cruises at 155 m.p.h., spans an 800-mile economy range with auxiliary tank. Send for your FREE *Navion* booklet.

Ryan Navion

NO OTHER PLANE COMBINES SO MANY FEATURES SO WELL

CHECK THESE NAVION PERFORMANCE FEATURES

• Cruising speed, up to	155 mph	• Landing distance over 50-ft. obstacle, only	875 ft.*
• Normal take-off run	560 ft.*	• Landing speed	54 mph*
• Take-off distance over 50-ft. obstacle, only	875 ft.*	• Rate of climb (first min.)	900 ft.*
• Normal landing run	450 ft.*	• Ceiling	15,600 ft.

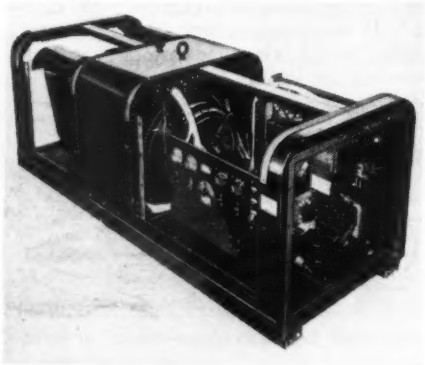
**With full 2,750 lb. gross load, zero wind at sea level*

Rely on Ryan RYAN AERONAUTICAL COMPANY, 407 LINDBERGH FIELD, SAN DIEGO 12, CALIFORNIA

NEW AVIATION PRODUCTS

Fuel Filter Cloth

For filtering jet and diesel engine fuels and other chemicals, metal cloth announced by **Michigan Wire Cloth Co.**, 2100 Howard St., Detroit 16, Mich., is suitable for applications where fine straining action combined with free flowing qualities are essential. Designated as specification 8700, material is said to combine advantages of very fine particle retention and favorable flow capacity with strength and corrosion-resistant qualities. It is available in Monel metal and Chromel "C", and woven to special order in various alloys, including stainless steel and high nickel alloys. Cloth was developed at University of Michigan and Detroit Testing Laboratory under a 5-yr. research program sponsored by manufacturer.



A.C. Power Supply

Auxiliary power plant, AP50, made by **Jack & Heintz Precision Industries, Inc.**, Cleveland 1, Ohio, can be used where 400-cycle, 208/120v., 3-phase a.c. output is required for testing instruments and controls of aircraft while on ground.

Powerplant is rated at 62.5 kva. at .8 power factor. Unit is supplied from 60-cycle, 400 or 220v., 3-phase a.c. input. Frequency variation from no load to rated load is well within 420-440 cycle range. Voltage automatically regulates to ±2v. of any value in adjustable range of 120-220v. limit.

Self-cooled aternator mounts directly to self-cooled, squirrel-cage-type induction motor with alternator rotor mounting directly on motor shaft. Exciter is driven through alternator rotor.

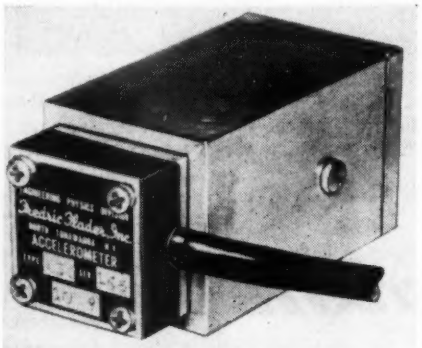
Control panel includes motor push button station, voltmeter, ammeter, kilowattmeter, frequency meter, and switches to permit metering of line-to-line and line-to-neutral voltages, currents, kw. per phase, etc.

Fold-up Vehicle

For private flyers who want to carry their means of ground transportation with them in the plane, 40-lb. portable "Scooter Cub," made by **Argyle Mfg. Co.**, Colchester, Ill., can be collapsed to fit into baggage compartment of small craft.

After landing, scooter is unfolded and ready to carry average adult at rate of 20 mph. It is claimed device will go about 100 mi. on gallon of gasoline, and can be unfolded or collapsed in few seconds.

Unit is powered by lightweight, high-speed, ball-bearing motor, has automatic clutch, steel frame and ball-bearing wheels. Dimensions when folded are 14 x 18½ x 23½ in.



Pickup Instruments

New line of miniature "Telefight" pickup instruments comprising accelerometers and pressure transmitters produce electrical output varying linearly with imposed acceleration or pressure. Output from units can be used for remote indication, recording or control purposes.

Instruments are offered by **Fredric Flader, Inc.**, N. Tonawanda, N. Y., who manufactures devices under license from Baldwin Locomotive Works. Company will modify units for use as airspeed indicators and altimeters on request.

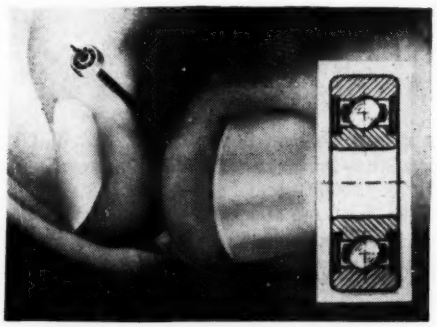
Devices incorporate cantilever beam on which four active 30-ohm strain gages are bonded, two on either side of beam, and arranged to form four arms of Wheatstone bridge circuit in a manner to produce maximum output.

Powered by d.c., units produce signal strong enough to permit direct operation of recording galvonometers. With a.c., they yield output suitable for carrier systems.

Instruments are temperature compensated for both zero shift and sensitivity to better than .01 percent deg. F.

Pressure transmitters come in ranges up to ±100 psi. and accelerometers up to ± 500 G. Pressure units can be used for measuring differential or gage pressure, or absolute pressure.

Transmitters weigh around 4 oz. with size of 2 × 2 × 1⅛ in. Accelerometers are approximately 1 × 1 × 2 in. and weigh 4 to 8 oz. depending on range. Frequency response of units is 50-500c./sec. depending on range.



Tiny Bearing

Development of miniature R-073 annular ball bearing, claimed to be smallest unit of its type produced commercially, is seen offering new possibilities in fields of instrumentation, subminiature motors, laboratory apparatus, testing devices, and other products having extremely small moving parts. Distributor is **Landis & Gyr, Inc.**, 104 Fifth Ave., New York 11, N. Y.

Bearing has seven evenly spaced balls, uninterrupted raceways, no filling notch, and comes with separator and double shield.

Designed for radial and thrust loads, it is made of chrome steel and ground on all functional surfaces. Outside diameter is 3 mm. (.1181 in.) and bore is .75mm. (.0295 in.). Ball diameter is ½mm. (.0197).

FINANCIAL

Market Action

(Listed Airline Stocks)

Carrier	1945-46 High	1948 Low	June 13, 1949 Close
American	19	6⅛	8⅜
Braniff	37	6¼	6⅛
Capital	49	3⅞	5⅞
Chi. & So. VTC	36	5¼	6¾
Colonial	45	5	4⅛
Eastern	33	13⅞	13⅛
National	41	4½	7
Northeast	25	2⅛	2¼
Northwest	63	8¼	7¼
Pan American	29	8¼	8⅛
TWA	79	9⅜	11⅛
United	62	9⅜	10¼
Western	40	5⅛	6

Airline Securities Resist Trend

Carrier shares hit low points late in 1948, now show surprising strength in face of a general decline.

In the face of a general market decline which resulted in new lows for a five-year period, airline shares have demonstrated definite resistance qualities.

This unusual performance of air transport securities is merely a reflection of the group's own peculiar business cycle. The industry's shares were generally at their low point late in 1948 when the cumulative effects of the year's adverse operations were very much in evidence. The series of increased mail compensation awards made by the Civil Aeronautics Board were yet to come.

With a successful year of safe flying and with many segments of the industry revived by higher mail pay, improved results readily became apparent. Further, as traffic during the first quarter of this year looked particularly impressive when compared with the poor first quarter of last year, the airline group's showing attracted attention as going counter to a general business trend.

▶ **Favorable Atmosphere**—Even after allowance for this statistical correction, traffic continued to make gains during the second quarter of this year, particularly in the face of declining railroad travel. It is this sort of atmosphere which appeals to investors and speculators looking for outstanding situations.

But airline shares previously submitted to one of the greatest price deflations ever experienced by any group in the space of about three or four years. This is evident in the comparisons presented in the accompanying table.

▶ **Boom and Bust**—The postwar boom in air carrier shares were of hysterical proportions and carried prices to levels difficult to sustain through earnings or prospects. As a consequence, the subsequent deflation was bound to be severe. The peak prices established during 1945-46 period are land marks that appear unbelievable when compared with present quotations. For example the top price of $63 per share for Northwest common is a far cry from the current price of $7.25, a decline of some 89 percent. Similar sharp deflations are evident for many other carriers.

Airline equities, long in a "drying-out" process, made their lows for the most part late last year, long before a large segment of the general market. This may well reflect a normal experience, as separate industries have their individual problems and frequently move in cycles of their own.

▶ **Business Barometer**—The market has demonstrated definite qualities of a barometer in reflecting coming events. Certainly, a falling stock market raises a serious question as to the nature of the business climate ahead. In any general business deflationary movement, the air carriers are by no means unaffected.

The inter-relation of the airlines with the general welfare of the country is evident in many ways. A high rate of industrial activity creates considerable movement of personnel and property. By the same token, a declining state of industrial production lessens the need for movement of personnel and property. An important qualification to this premise is the strong "growth" element still present in air transportation. It is this quality which may permit the industry to continue its present tendency to run counter to the general trend of declining business.

▶ **Analysis**—Despite the vigorous recovery being demonstrated by the airline group, the individual status and problems of each airline, are reflected in a lack of uniformity in the market action.

Of the 13 issues shown in the accompanying table, five were at lower levels following the decline of June 13th than that which prevailed at the bottom in late 1948.

• **Colonial** recently sold into new low ground, reacting to the competitive factor of Trans-Canada Airlines authorized to contend for the former exclusive Montreal-New York traffic.

• **Northwest** also made new lows, relative to its 1948 bottom, as a result of the concern being expressed as to the company's ability to cope with its pressing financial problems. At this writing, the CAB has not approved the pending $12 million Reconstruction Finance Corp. loan.

• **Braniff and Pan American** were off but fractionally from the 1948 lows after the recent selling waves.

• **Eastern** weakened marketwise recently and is off about 5.4 percent from its 1948 low point. Unquestionably, much of this current decline is due to the apprehension because of possible intensification of competition as a result of proposed interchange deals and participation in stock ownership of National by Pan American.

• **National** shows the sharpest recovery into 1948, despite recent market weakness, gaining some 55 percent over its 1948 low. However, National late in 1948 was still being plagued by its pilots' strike and the company's financial condition was seriously impaired. Settlement of the labor controversy and a series of equipment interchange proposals with Pan American Airways soon reversed the carrier's outlook.

• **Capital's** sharply improved status due to the retroactive mail pay award and the genuine recovery in operations as a result of its own efforts, is manifested by the 52 percent gain of its common stock or its 1948 low.

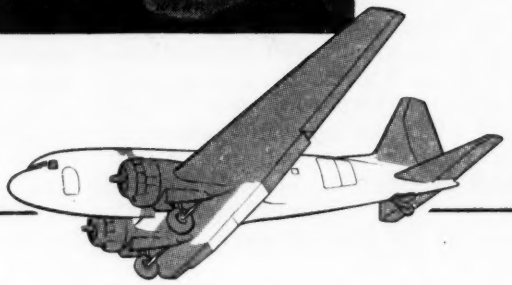
• **American's** complete conversion to all postwar passenger transport equipment has given the carrier a definite competitive advantage with comparative results becoming evident in earnings reports of recent months.

—Selig Altschul

Portrait of future profits!

NEW DOUGLAS

Super DC-3



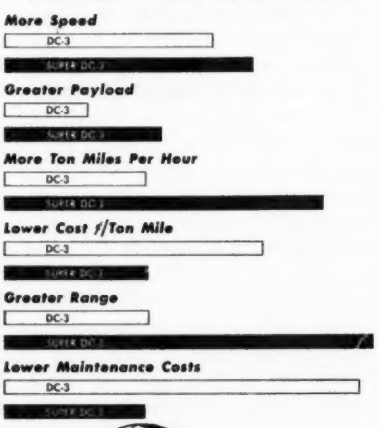
Think what this means to your profit picture—a fast, modern version of the dependable Douglas DC-3 that will operate at *less cost per ton mile!*

At modest cost your present DC-3s can be converted to the new Douglas Super DC-3. New swept-back wings . . . new powerful engines that increase speed to 250 mph . . . built-in stair ramp to facilitate loading and unloading . . . new rear cargo compartment . . . new large, self-service luggage racks—these are just a few of the features of the Super DC-3.

Whether your airline is large or small—it will pay you to get the full facts on the new faster Douglas Super DC-3—modern version of the most famous, time-tested airliner ever built.

DOUGLAS AIRCRAFT COMPANY, INC., SANTA MONICA, CALIFORNIA

• FEATURES OF THE SUPER DC-3 •



MORE PEOPLE FLY MORE PLACES BY DOUGLAS

New Ideas in the Personal Plane Field

Designers striving for slower landing speeds in various ways.

By Alexander McSurely

Experimental developments in the personal plane field from outside the major companies have recently reached a point numerically unequalled since early postwar days when the light plane boom was at its highest.

In Boston, Profs. Otto Koppen and Lynn Bollinger announced sale of manufacturing rights of their radical slow-flying two-place Helioplane to Fairchild Engine & Airplane Corp.

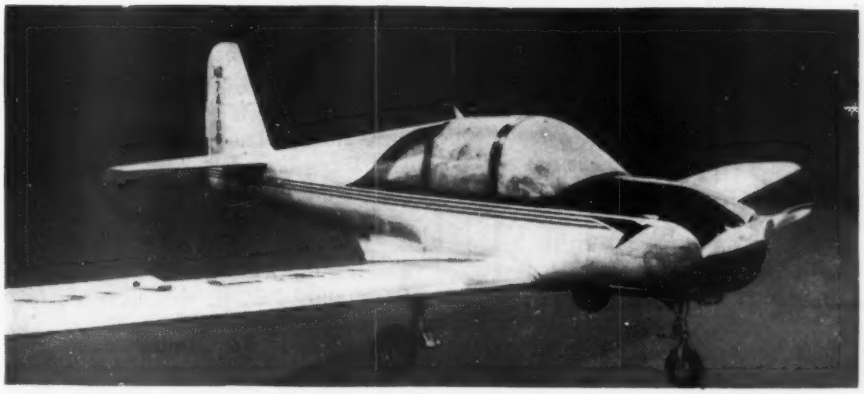
It is understood sale includes rights for military and commercial developments of planes of more than 165 hp., while the Aeronautical Research group retains the rights to smaller planes. First public demonstration of the 90-hp. prototype Helioplane is to be held in August.

In Bridgeport, Conn., Mischa Kantor, Russian-born and Messerschmitt-trained engineer, formerly associated with North American Aviation and Luscombe, took the wraps off his new 150-hp. Franklin-powered four-place all-metal "Strat" personal plane, scheduled for first flight tests in July.

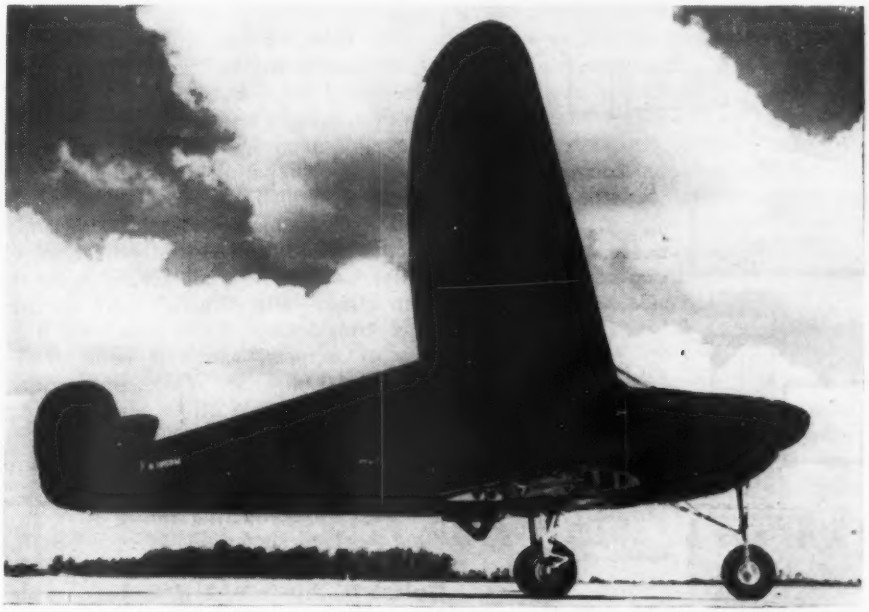
The four-place Strat, a low-wing plane with fixed tricycle landing gear, is designed for cruising speed of 135 to 140 mph. with a range of 600 miles fully loaded with four persons and 80 lb. baggage.

The plane has 35 ft. wingspan, is 23 ft. 6 in. long and weight empty is 1250 lb. Two 20-gal. rubber Pliocel wing tanks are supplied. A large Plexiglas enclosure for the cockpit supplies good visibility, and cockpit door arrangement is designed for ease of loading and unloading bulky cargo objects. A novel "airline seat" touch is supplied in the two front seats either of which can be placed in reclining position by a push-button.

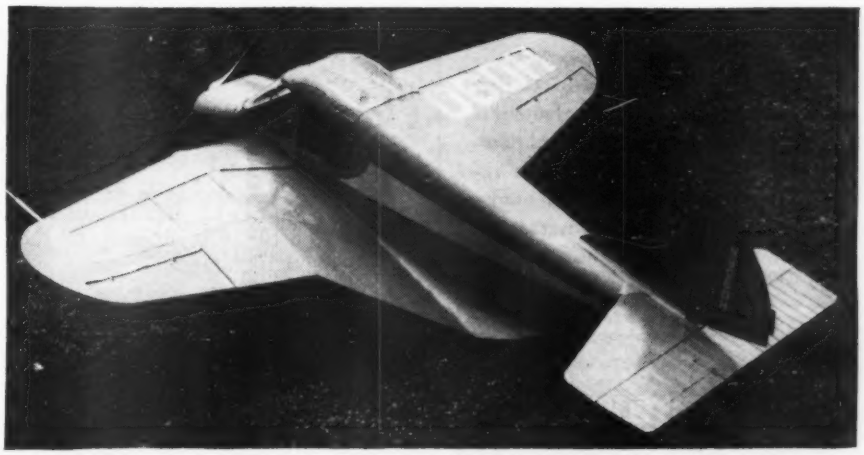
Tentative price of the Strat has been set at $4000 by the Strat Aircraft Corp., which will produce it. The design seeks to achieve easy accessibility to working parts and interchangeability of parts wherever possible. Kantor stated that the design of the Strat's



STRAT, developed by Mischa Kantor, is example of hopes for low price, while . . .



. . . JUPITER, of Jamieson, has folding wings for easy, economical storage and



. . . PARAPLANE, or Lanier, tackles low landing speed problem in unorthodox way.

RIVET PROBLEM—

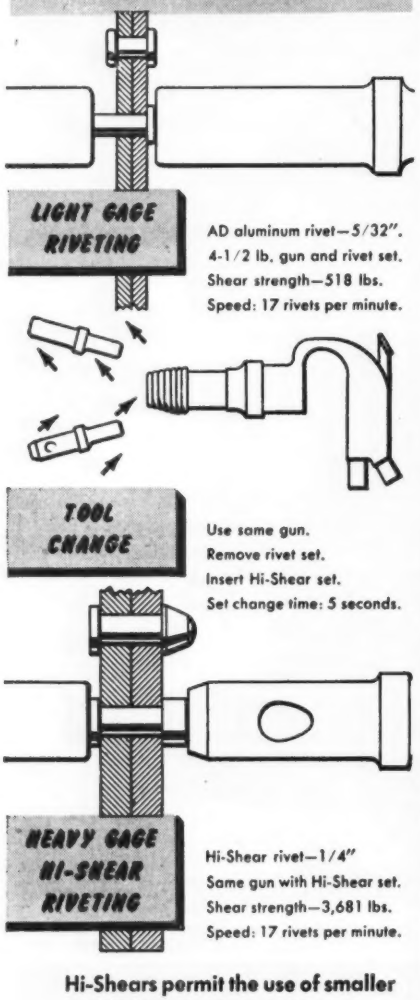
Change in light material gages to heavy gages—light loads to heavy loads.

METHOD—

What fastener?
What tools?
How much time?

SOLUTION—

HI-SHEAR rivets!



LIGHT GAGE RIVETING

AD aluminum rivet—5/32".
4-1/2 lb. gun and rivet set.
Shear strength—518 lbs.
Speed: 17 rivets per minute.

TOOL CHANGE

Use same gun.
Remove rivet set.
Insert Hi-Shear set.
Set change time: 5 seconds.

HEAVY GAGE HI-SHEAR RIVETING

Hi-Shear rivet—1/4"
Same gun with Hi-Shear set.
Shear strength—3,681 lbs.
Speed: 17 rivets per minute.

Hi-Shears permit the use of smaller and lighter riveting equipment . . . hence, more speed and less worker fatigue. Since Hi-Shear riveting is accomplished with standard riveting guns and squeezers, no expensive pullers or special single-purpose equipment is necessary.

U. S. and foreign patents — Trademark registered.

THE *hi-shear* RIVET TOOL CO.
1559 SEPULVEDA BOULEVARD
HERMOSA BEACH, CALIF.

PHEOLL MANUFACTURING COMPANY
5700 ROOSEVELT ROAD
CHICAGO 50, ILLINOIS

parts was aimed at making an airplane which could be produced on a competitive price basis without having to "tool up to the teeth and operate under an auto industry mass production schedule."

In Deland, Fla., Jamieson Aircraft Co. expects to complete the first 10 production versions of the three-place all-metal 115-hp. Jupiter by the end of July, and hopes to have CAA certification by that time.

In Hagerstown, Md., Willard Custer plans to resume test flights soon with his flying test-bed channel wing plane, powered with two 75-hp. Lycoming engines, and designed for extremely slow flight using boundary layer control.

In Marlton, N. J., Lanier Aircraft Corp. reports it has been flight testing the latest in a long line of experimental "Paraplanes," this one a two-place prototype with a 20-ft. wingspan and 90-hp. engine.

Plane uses an unorthodox patented "vacu-jet" wing which is controlled from the cockpit to give varied effects of flap, airbrake and boundary layer control.

In Tyler, Texas, Johnson Aircraft Corp., successor to the company that developed the ill-fated plywood Johnson Rocket, is flight testing a prototype four-place all-metal 185-hp. Bullet personal plane, and preparing to put it into production.

Three Roadable Aircraft developments, the Fulton Airphibian at Danbury, Conn., the Hall Flying Auto at San Diego—both of which have already had considerable flight time—and the Taylor Aerocar, which is being road-tested at Longview, Wash., preparatory to flight tests are other personal type aircraft under development.

In Deep River, Conn., Spratt Aircraft Co. has completed another in the series of experimental tilting wing flying boats designed by George Spratt. First short test hops of the new two-place 65 hp. model have been made successfully in Long Island Sound this summer and Spratt is also working on a new landplane version of the controllable wing machine.

Plane Ownership Up

Wichita leads the metropolitan areas of the country in the ratio of airplanes to population, CAA reports disclosed last week, with 76.1 airplanes to each 10,000 of population in the area.

Phoenix, Ariz. was second with 49.6 planes per 10,000 inhabitants, Dallas third with 37.8, Miami fourth with 36.6 and Ft. Worth fifth with 36.2.

The CAA analysis, in a publication titled "Personal Aircraft" showed that increases averaging approximately 150 percent were shown in the number of civil aircraft in the principal metropolitan areas and cities of 25,000 and over, from Jan. 1946 to July 1948.

Classifying the metropolitan centers according to interests, as industrial, market centers, and institutional, the CAA statisticians found that the largest gain in aircraft usage was in institutional centers of 50,000 to 249,999 population.

Crosscountry Flight

First mass flight of amateur pilots across the continent, from Portland, Ore., to Portland, Me., and return was completed without accident or unpleasant incident.

Fifty-five light planes carrying more than 160 aerial ambassadors—Oregon business men, professional men and farmers—in two weeks time crossed the continent from sea to sea, traversing 24 of the 48 states and covering 7000 route miles.

Route of the air tourists provided stops at Salt Lake City, Utah; Kansas City, Mo., Indianapolis, Ind.; Akron, Ohio, and Lock Haven, Pa. The return trip was made by separate routes to allow visits to points of individual interest. Most of the fliers stopped at Washington, D. C., enroute home.

A special C-47 was provided by Air Secretary Stuart Symington to carry press and radio representatives on the journey.

'No-Bounce' Gear

New Aeronca "no-bounce" landing gear and "Spray Champ" version of the Champion tandem plane for agricultural spraying were demonstrated at recent distributors convention held at the Aeronca Aircraft Corp. Middletown, Ohio, plant.

The new oleo shock strut is being made available on Model 7 Champions and Model 11 Chiefs. Kits are being provided for field conversion. The manufacturer states that the new gear unit has been tested in "many thousands of landings" and that it is "virtually impossible to bounce the plane during a landing regardless of field condition, flight technique or other conditions."

A set of two of the new oleo shock-strut units is listed at $78 for a field conversion kit, and is supplied on new planes for an additional cost of $15 as original equipment.

Principal speakers at the Aeronca sales meeting included John A. Lawler, president; Floyd B. Simmen, general sales manager; Ray Hermes, contracts manager; Leon C. Wolfe, chief engineer; Bill Runyan, service manager, and S. J. Kuderer, treasurer, Aeronca; and Al Vandenberg, Continental Motors service manager.

PAA-AOA Merger Hearing Ends

Heat but little light on major issues features long testimony; President holds key to proposal's future.

By Charles Adams

The marathon hearing on Pan American Airways' proposed acquisition of American Overseas Airlines wound up late last month with opponents of the deal fighting hard to tag it as another PAA attempt to further "chosen instrument" ambitions previously found contrary to the national interest by Congress and Civil Aeronautics Board.

Close to six weeks of heated testimony shed comparatively little light on whether U. S. trans-Atlantic air operations would be strengthened—and subsidy requirements cut—by reducing our flag lines in this area from three to two. On the other hand, foes of the PAA-AOA merger succeeded in spotlighting Pan American's alleged ruthless and persistent efforts to kill off or absorb competing lines during the postwar period.

▶ **President Holds Key**—Future of the merger proposal still cannot be predicted. Key to the situation is not held by CAB but by the White House.

The President must approve all overseas and international route decisions made by the Board. And in the past few years the White House has shown a growing tendency to reverse CAB.

Legal maneuverings and the dragged-out hearings already have blasted PAA's hopes of getting CAB approval for the merger by the Sept. 15 target date. But despite rumors that the deal would be dropped because of delays, Pan American president Juan Trippe and American Airlines president C. R. Smith refused to back out.

▶ **Early Setbacks**—PAA suffered two setbacks even before the hearings opened on May 16. Former CAB chairman James M. Landis, representing AOA employees fighting the merger, was permitted to introduce into the proceedings material dealing with Pan American's purported monopolistic practices.

Concurrently, CAB's public counsel and economic staff advanced a plan to strengthen TWA and maintain a competitive balance on the trans-Atlantic run should the PAA-AOA agreement be approved. The proposal would sever Pan American's round-the-world link and deprive the carrier of important rights it now enjoys in Europe and the Middle East.

▶ **Savings Cited**—Trippe said that he would not "under any circumstances" accept the conditions CAB's staff and TWA wanted to attach to the merger (AVIATION WEEK, June 6). He added that approval of the deal without crippling restrictions would save the government $9 million in mail pay annually and strengthen the U. S. against increasingly severe foreign airline competition over the North Atlantic.

Pan American feels that Landis was successful in turning the recent hearings into a "trial of all his grudges against PAA." According to Pan American, Landis tried to kill the merger by delay and "talking it to death."

In an effort to speed future action on the route transfer agreement, Pan American and American Overseas want CAB to handle the case without waiting for the hearing examiner to prepare a report. Unless the report is dispensed with, chances that the case will be decided this year appear negligible.

▶ **Monopoly Opposed**—Approval of the merger hinges on whether President Truman—and to a lesser extent CAB—believe it will result in PAA having an American-flag monopoly over the Atlantic. It is felt in some quarters that TWA would be unable to compete effectively with a combined PAA-AOA operation.

President Truman's opposition to the "chosen instrument" dates back to his terms in the Senate.

CAB also is on record as being strongly opposed to monopoly. On the other hand, the Board has publicly requested the air transport industry to submit merger proposals which would result in greater efficiency and economy. Only last April, CAB declared that something must be done about the increasing mail pay needs of PAA's and AOA's North Atlantic operations.

Verbal fireworks were touched off almost daily during the extended hearings.

▶ **Secret Pact Alleged**—Trippe steadfastly denied CAB's public counsel's intimations that he (Trippe) had made a secret agreement in 1943 with British Overseas Airways Corp. officials providing for division of traffic over the Atlantic, in Europe, South America and other parts of the world.

Last of four provisions in the alleged cartel-type agreement cited by public counsel provided that both Trippe and his British counterpart would deny existence of the pact if ever questioned about it.

Brig. Gen. A. C. Critchley, who headed BOAC at the time of the rumored secret understanding, also took the stand to deny it was made. But Adolph A. Berle, Jr., U. S. assistant secretary of state from 1938 to 1944, testified that the American government heard reports of such a deal; checked with the British government; and was assured that even if an agreement was made it would lack the official sanction necessary to carry it out.

▶ **State Department Warning**—Trippe said he could not recall receiving a warning last year from former under secretary of state Lovett advising PAA not to interfere with U. S. efforts to obtain an air transport agreement with the Mexican government. Public counsel said he was told of this incident by "a very reliable authority."

Eastern Air Lines, Braniff Airways and Western Air Lines have certificated routes to Mexico but have been unable to activate them because of repeated breakdowns in U. S.-Mexican air transport pact negotiations. EAL and Braniff officials have indicated belief that PAA intrigue was responsible for failure of the talks.

▶ **Northwest Deal**—The Pan American president denied attempts to trade PAA's Alaskan routes for Northwest Airlines' North Pacific link to the Orient. He said his company had never tried to get control of Chicago & Southern Air Lines or Western Air Lines.

"We were approached by Capital Airlines on whether we might be interested in a deal. We told them we weren't interested."

Trippe said his discussions early in 1947 with Howard Hughes, TWA's principal stockholder, regarding acquisition of TWA's routes fell through because Hughes' ideas on the value of TWA's overseas system "were far out of line."

According to Trippe, Hughes (whom Trippe had never met previously), originated the talks. "He (Hughes) wanted to effect a merger of the entire TWA operation, domestic and international, with PAA, while I was interested principally in the overseas end of TWA."

Final meeting with Hughes, Trippe declared, was held at a deserted airport in southern California to keep news of the meeting from the public. (Previ-

ously, AVIATION WEEK had reported exclusively that secret talks were being held. PAA and TWA officials denied the story, calling it "erroneous and irresponsible.")

▶ **Patterson Testifies**—United Air Lines president W. A. Patterson testified at the PAA-AOA route hearing that a year or 18 months ago he had talked merger with Trippe. Patterson said it all started when one of UAL's directors sat next to Trippe at a social function in New York.

Trippe reportedly told the UAL director that Pan American expected to receive domestic routes in 30-60 days and that he (Trippe) wasn't sure this would benefit anybody. Stating there was a possibility of PAA buying TWA, Trippe then allegedly suggested it might be worth while discussing merits of a PAA-UAL merger.

The UAL director reported the conversation to Patterson, who contacted Trippe in New York two weeks later. Patterson declared that Trippe told him he had nothing specific in mind. "He (Trippe) talked in generalities but mentioned a PAA-UAL stock exchange," Patterson said.

▶ **Three-way Merger**—Delta Airlines president C. E. Woolman testified that about a year ago Trippe, having heard of Delta-National merger talks, invited him (Woolman) to Washington. The PAA President suggested the possibility of a three-way Pan American-National-Delta merger, but Woolman said he felt it would be too complicated.

How to Cut Ground Travel Time

Los Angeles Airways head says helicopters are best solution to problem of slow transit from fields to cities.

Helicopters, and not the construction of expensive new freeways or arterial highways, offer the fundamental solution to the problem of slow travel time between downtown areas and airports, according to Clarence M. Belinn, Los Angeles Airways president.

"When helicopters of suitable capacity are available for this type service they will step up long-haul passenger, mail and cargo business for all the airlines and put airports in the black. We will see the full growth and development of the helicopter industry with enormous impact on the fixed wing industry only after helicopters can effectively transport anything other aircraft can carry."

Belinn made this forecast to a joint session of the Royal Aeronautical Society of Great Britain and the Institute of Aeronautical Sciences in New York.

▶ **Surface Delays**—The LAA president pointed out that over 2 million people live in the downtown area of Los Angeles, which is 45 minutes to an hour by surface transportation from the airport. Surface fare from city to field is about $1.40, he said, "and the franchise operator is not getting rich."

At present, Belinn declared, when a passenger disembarks from the plane at the airport he usually has to stand around until his baggage is ready and until the buses accumulate a full load. In many instances, the passenger must also transfer to a taxi (with another handling of baggage), and finally enter his hotel—all the moves involving effort, tips and other charges.

"Our answer to this situation would simply be to construct a facility on the rooftop of the larger and strategically-placed hotels so that helicopters could land and be serviced with passengers by the hotel porter—just as Los Angeles Airways' mail is now being handled on the downtown Post Office Terminal Annex Building."

▶ **Helicopter Fare**—"On the basis of present taxi rates, the helicopter fare to the airport would be $2.50, or 25 cents a mile for ten miles. At a cruising speed of 120 mph., the flight would take five minutes.

"If this proposition were carried to its proper conclusion, the helicopter would not land on the ground at the airport but on the rooftop of the field's central administration building. The whole transaction would be on a through-fare basis, with no hidden or extra charges or inconvenience."

Belinn conceded that a number of airline passengers might not use the helicopter service. He noted, however, that there is a great potential, since Los Angeles Airport clears 90,000 passengers monthly, based on 175 landings and takeoffs daily.

▶ **Revenue Potential**—"With 10-place equipment, an airport-to-city helicopter operator has a potential of $2.50 a mile," the LAA president continued. "This, of course, is based on a 100 percent load factor; but no credit is given for mail and express, which together should be good for about 50 cents a mile.

"So, in general, we look for a gross revenue of between $2 and $3 per mile from a 16,000 gross pound helicopter employed on high density short-haul routes. As the routes stretch, the per mile passenger fare will drop. I should imagine it would level out on a system average of between 15 and 20 cents."

Since inaugurating mail service with its Sikorsky S-51s in October, 1947, LAA has carried over 2000 guest passengers. Belinn said these people have shown no fear of the helicopter as a vehicle and have asked frequently when it would be used for taxi service.

▶ **Costs Cut**—LAA's operating costs have been cut steadily and during the first quarter of this year were about 96

EXECUTIVE COMFORT

Lower-deck lounge of Northwest Airlines' first Boeing Stratocruiser becomes an office as William M. Allen, Boeing president (left), receives a check for $1.5 million from Croil Hunter, NWA president. Wellwood E. Beall, Boeing vice president-engineering and sales and K. R. Furguson, NWA vice president-operations and engineering, look on. Craft will go in service this summer on NWA's transcontinental route. Northwest plans to retire all DC-3s within a month and modify DC-4s for air coach and freight.

cents a plane mile. The company last month asked the Civil Aeronautics Board for authority to carry passengers as well as the present mail and express (AVIATION WEEK, June 6).

Belinn believes there is urgent justification for commercial helicopters in two categories—one of six to eight thousand pounds gross, the outer roughly double that size. Minimum cruising speed of the smaller craft would be 100 mph., with the larger one cruising at 120 mph.

"A good rule-of-thumb may be 100 hp. per thousand pounds of gross weight. Also, we could figure on one passenger and 200 lb. cargo capacity per thousand pounds gross weight. These figures should not be hard to live up to even now."

► **Equipment Situation** — Several U. S. manufacturers, including Sikorsky, Bell and Piasecki, have produced military helicopters in the general 6000-lb. class mentioned by Belinn; but no American helicopter in the 16,000-lb. category has been flown.

Only major experiment in the U. S. with airport-city helicopter taxis was conducted by Skyways Corp. in Boston during the spring and summer of 1947. The company used three-passenger Sikorsky S-51s to make the three-mile flight from the rooftop of an eight-story downtown building to Logan International Airport.

Fare was $3.50 for the three-minute flight, compared with $1.50 for the 20-minute taxi ride from city to airport. The service was discontinued because of inability to achieve a profitable load factor.

Strike Blocks Fuel

A sudden strike of 20 Willis-Rose Corp. gasoline-truck drivers at New York International Airport has shifted fueling activities for 18 foreign airlines and one domestic carrier to LaGuardia Field and Newark Airport.

The strikers—members of Local 553, Teamsters Union, AFL, are demanding higher wages and a shorter working week. But Charles Willis, Jr., Willis-Rose president, claims the strike is premature, since no election has been held by employees to decide which union represents them.

National Mediation Board has decided that the truck drivers, in addition to mechanics, maintenance personnel and ground service personnel, fall into a single unit for purposes of collective bargaining. Willis claims he has urged the Teamsters to become a candidate along with the Transport Workers Union and the International Assn. of Machinists for the right to represent the employees, but that the Teamsters have refused. NMB will probably hold an election within the next two weeks.

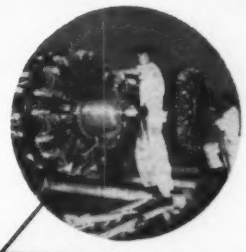
IN THE

SERVICE

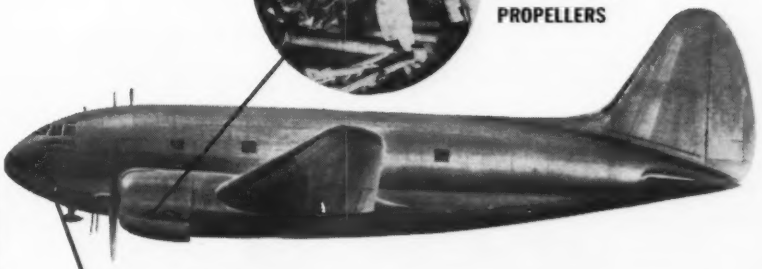
of

AIR TRANSPORT

FOR ONE AIRCRAFT OR A FLEET...



ENGINES and PROPELLERS



Licensed C-46 "Commando" parts manufacture and CAA Approved Conversion

COMPLETE AIRFRAME

INSTRUMENTS

Complete CONVERSION... OVERHAUL and MAINTENANCE...

Increased operational efficiency at lowest cost results when American Airmotive takes over your service problems. We're fully equipped with the most modern precision machinery to check and repair all commercial aircraft components right in our own five-acre plant... and there's no delay awaiting parts at American Airmotive for we have 691,000 fully indexed different aircraft items on hand. 54% of our 385 shop employees are certificated mechanics -- almost 2½ times the percentage required by CAA.

We Are Prepared To Serve You NOW...

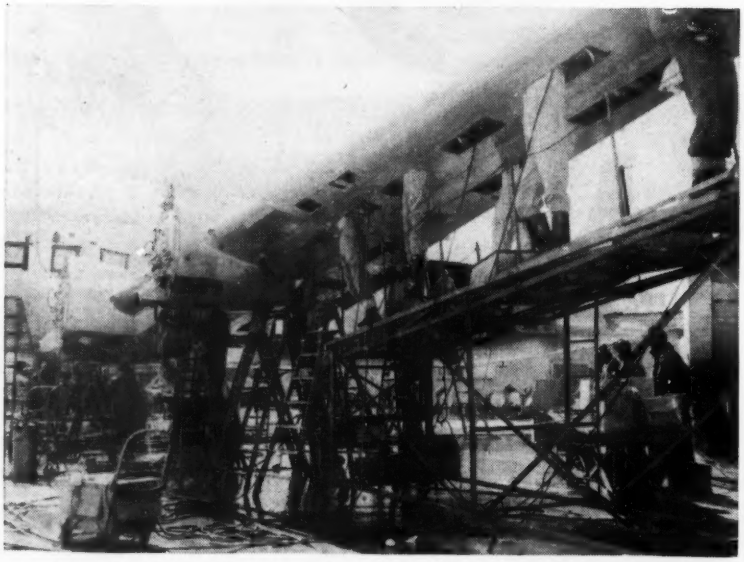
American Airmotive CORP.

MIAMI INTERNATIONAL AIRPORT
P. O. BOX 6, MIAMI SPRINGS, FLORIDA
Phone: 88-3445 • Cable AMAIRCO

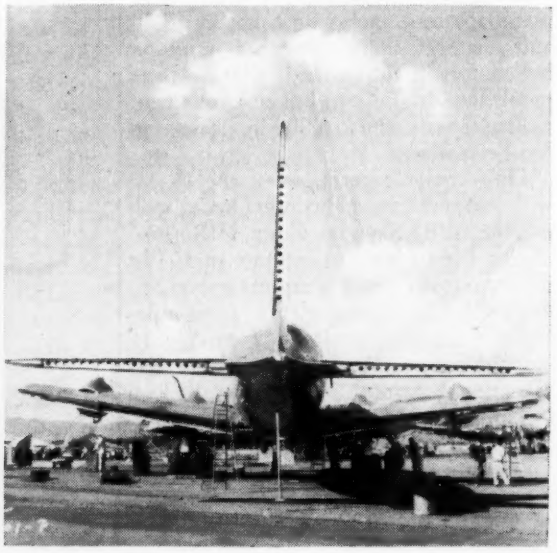
Wash., D. C. Office
1213 duPont Circle Bldg.

If your requirements necessitate overhaul and maintenance at your location, let us supply your replacement parts. We'll gladly give you the benefit of our installation and maintenance experience.

1 Just back from the Berlin Airlift, or from Marine Corps or Navy transport duty, C-54s are received at Lockheed Aircraft Service and the engines run up and checked. Then engines are removed, components sent to the shop and the engines shipped out for overhaul.



4 At wash racks, fuel tanks are stripped preparatory to resealing. Strip and reseal normally is done only once dependent on type of sealant.



5 Next, wing control surfaces and outer wing panels are removed. These, also, go to shop for inspection.

Cycle Reconditioning Cuts Overhaul Time

The Berlin Airlift has been the proving ground for many an idea of an airline man that commercial air transport never gave him an opportunity to try. And the lift has demonstrated the practicality of other ideas that airlines are now studying for possibility of adaption to commercial transport.

One of these is cycle reconditioning, typical steps of which are shown on these pages.

Last week, as the Berlin Airlift marked its first anniversary, it was apparent that success of the lift was due primarily to two factors: traffic control and navigational aids brought to an unprecedented efficiency; and peak utilization of equipment that was approaching obsolescence when it was put on the lift. Key to the latter factor is cycle reconditioning. The quarterly report of the Military Air Transport Service says: "The aircraft (reconditioned C-54s) are returning overseas in better mechanical condition than when they were first assigned to the Airlift."

Principle of cycle reconditioning is simple: utilize the usual engine-change periods (usually 1000 hours) to perform many additional items of maintenance, inspection and modification. Proponents claim these advantages:

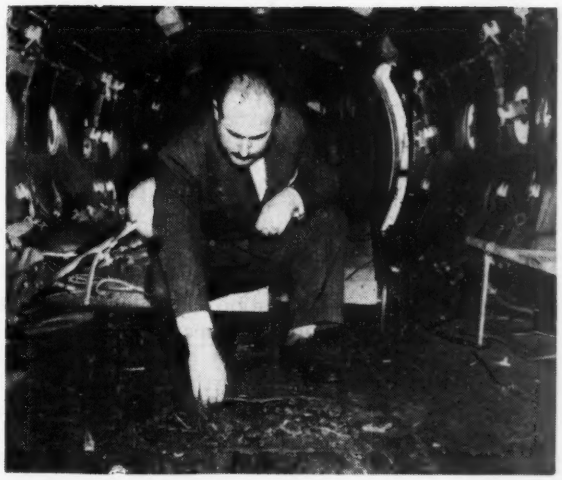
- **Utilization is increased** through reduction of interim mechanical difficulties.
- **Decreased time and less work** are required for major (8000-hour) overhauls.

Perhaps the first commercial organization to go into cycle reconditioning was Lockheed Aircraft Service, largest of the three firms sharing the overhaul work for Airlift planes. LAS got into cycle reconditioning in 1947, has turned out more than 200 planes. In addition to Airlift C-54s, it reconditions Navy and Marine Corps R5Ds, and just signed a $341,140 contract to handle ten MATS Lockheed C-121 (Constellations).

LAS, at Burbank and MacArthur Field, Sayville, N. Y., follow standards adopted by MATS for cycle reconditioning of Airlift C-54s. A plane is brought in after every 1000 hours of flight. Engines are removed and replaced (the old one sent to the Air Force engine overhaul base at San Antonio), and other items reconditioned.

At 2000 hours, the 1000 procedure is repeated, and other work done. At 3000 hours, a plane gets the 1000-hour treatment, plus new overhaul. At 4000 hours, it gets the 1000-, 2000- and 4000-hour reconditioning. A 5000-hour cycle consists of the 1000-hour and 5000-hour work. A 6000-hour cycle is the 1000-, 2000,- 3000- and 6000-hour work.

At 7000-hour mark, the plane goes through the 1000- and 7000-hour cycle. At 8000 hours, major overhaul is completed and plane starts through a new cycle.



2 Interior of plane is inspected. This shows the beating Berlin Airlift planes must take.

3 Teardown of the structure begins with removal of empennage control surfaces. These parts go to shop for rework.

6 At next station on LAS line, landing gear and interior items are removed, reconditioned, modifications made, and re-installed.

7 Meanwhile, outer wing panel tank structure is being inspected prior to resealing.

8 Reconditioned plane, ready for another thousand hours of service, goes through final engine run-up and tests. LAS has got periodic cycle work down to less than 8000 manhours and about 20 days time. A tank stripping and resealing job adds about another 15 days. Approximately 450 components and items are removed from the airplane during the reconditioning process.

KESTER

the Greatest Name in Solder!

THERE is a reason for Kester's tremendous success in the industrial field. A staff of highly-trained technical engineers and a half-century of Kester "know how" are teamed to bring you the finest flux-core solders made.

As a measure of this ability, Kester produces over 100,000 different types and sizes of flux-core solders.

Contact Kester's Technical Department on your soldering problems. There is no obligation.

WRITE FOR THE NEW, FREE MANUAL—"SOLDER AND SOLDERING TECHNIQUE"

A complete analysis of the application and properties of soft solder alloys and soldering fluxes.

1899 50th Anniversary 1949

KESTER SOLDER COMPANY
4201 Wrightwood Avenue, Chicago 39, Illinois

FACTORIES ALSO AT NEWARK, NEW JERSEY • BRANTFORD, CANADA

KESTER SOLDER

Senate Group Asks New Air Legislation

Senate Interstate and Foreign Commerce Committee is expected to push for immediate enactment of two aviation bills as a result of its comprehensive hearings on the airline financial situation.

They are:

• 1. **Authorization of $300,000** for a Civil Aeronautics Board study to establish "service" rates for route segments of the scheduled system. The Committee's chairman, Sen. Edwin Johnson (D., Colo.), will sponsor a provision that the plan for separate service and subsidy payments to carriers be put into effect July 1, 1950.

► **Post Office Payments**—Post Office Department would pay the carriers' service rates. Additional subsidy payments would be made by CAB. Congress would pass on each CAB appropriation for subsidization.

• 2. **Requirement that CAB report** to Congress on all pending cases over six months old, and report periodically thereafter on their progress. This is designed to speed up Board action.

► **Delays Criticized**—"Sometimes no decision is worse for the applicant than an adverse decision," Johnson commented. "We want good decisions based on sound judgment, but letting this air freight case, for example, drag on for three years is good example of intolerance and persecution by bureaus. An arbitrary time limit cannot be placed on proceedings, but Congress should be informed on cases that are being dragged out."

Johnson will also recommend that legislation setting up an independent Air Safety Board be reported out. Since the general attitude in Congress is to accept the Hoover Commission's recommendations on reorganizations, it is doubtful that the measure will be passed.

The Hoover Commission did not propose an independent safety board. It advocated a transportation service in the Department of Commerce, under which would come a Bureau of Civil Aviation, embracing the present activities of the Civil Aeronautics Administration and National Advisory Committee for Aeronautics, and continued independent status for CAB.

► **Hearings Concluded**—The Senate committee was scheduled to wind up its hearings June 30. The professional staff will continue studies in the airline field.

Action on major measures—a government program for cargo and transport prototype development, carriage of government traffic by air, regulation of contract operators, etc.—will be postponed until the views of the military services are known.

Airlines Seek More Military Business

The airlines have shoved their foot a little farther into the door of the $100 million annual military transportation business by offering a 10 percent discount to military personnel. At the same same time the National Military Establishment moved to loosen restrictions against official use of commercial air transport.

The combination is expected to raise the airlines share of military transportation business from the present 2 percent to about 10 percent—a dollar jump from about $2 million to $10 million annually. The 10 percent military discount became effective July 1.

▶ **Liaison Bureau**—Air traffic conference of the Air Transport Assn. will establish a military bureau in its Washington headquarters to handle liaison with the National Military Establishment on official travel. Frank Macklin will head the new bureau.

The National Military Establishment now has a travel agreement with the railroads that will remain in effect until the end of the 1950 fiscal year. This agreement gave rails highly preferential treatment on official military travel and restricted air travel to the highest priority missions. Railroads will retain their preferential treatment for the next fiscal year but the restrictions against air travel use have been slightly relaxed.

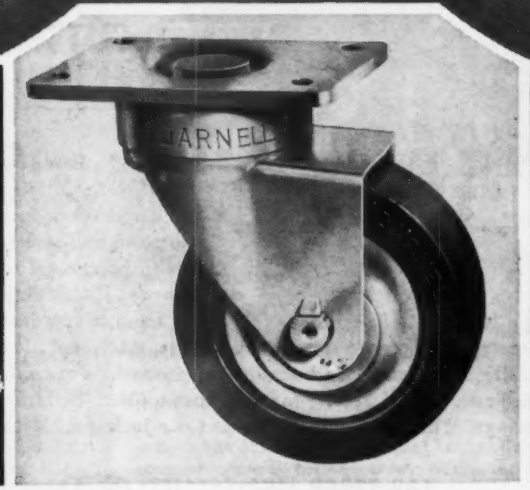
▶ **New Study**—Defense Secretary Louis Johnson has directed the Munitions Board to make a thorough study of military traffic problems with a view toward drawing up new travel purchase agreements for fiscal 1951. The NME has indicated that it wishes to make more extensive use of commercial airlines for official travel.

Continental Sells DC-3s to Southern

Continental Air Lines has sold three DC-3 transports to Southern Airways Inc., Birmingham, Ala. Sale price with spares was $140,000.

The planes were sold for $45,000 each along with $5000 worth of spare parts. Southern Airways is a feederline which began operations on June 1.

Sale of the three aircraft was made possible by the inauguration of service by Continental Air Lines between Denver and San Antonio with Convair-Liners on June 1. Continental plans gradually to sell more of its 11 DC-3s as it puts more Convair-Liners on its 3000-mile system. Southern Airways has an option to purchase additional DC-3 aircraft from Continental whenever the planes are replaced.



Darnell Casters
& E-Z ROLL WHEELS

Nearly 4000 TYPES of CASTERS & WHEELS

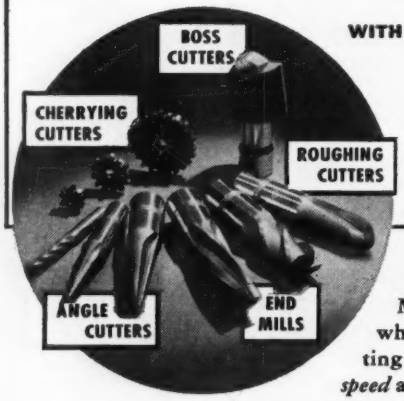
For light, medium or heavy duty service Darnell Casters and Wheels are dependable — saving floors, equipment, money, time and temper.

DARNELL CORP. LTD.
Long Beach 4, Calif.
60 Walker St., New York 13, N. Y.
36 N. Clinton, Chicago 6, Ill.

FASTER FEED...LOWER COSTS!

More Work between Grinds

WITH **T-J CUTTERS**

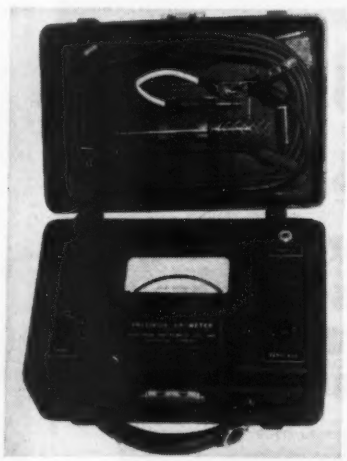


T-J Die Sinking Milling Cutters "have what it takes" for cutting tough die steels with *speed* and *accuracy!* They're *extra sturdy* . . . hold a sharp edge longer . . . less breakage! Made from a standard, extremely high grade steel . . . properly machined . . . scientifically heat-treated and accurately ground. Wide range of styles and sizes . . . ready for your tough jobs! Send for new catalog. The Tomkins-Johnson Co., Jackson, Michigan.

FOR TOUGH JOBS SPECIFY T-J

TOMKINS-JOHNSON

DIE SINKING MILLING CUTTERS



The Highest Accuracy Possible with Hastings' Precision Air-Meter . . .

Designed for applications requiring the highest accuracy possible, the Hastings Precision Air-Meter is perfectly suited to meteorological and research installations and to general process control.

The Model B and two types of non-directional probes (housed in the cover) are illustrated.

Prices and Specifications on Request

HASTINGS INSTRUMENT CO., INC.

HAMPTON, VA.

RUSCO for Safety Belts

Here is another example of Rusco Research, a shoulder strap for every Rusco Safety Belt.

Good practice requires that safety belts be replaced periodically.

Why don't you replace yours now with a famous Rusco Safety Belt

RUSCO AERO PRODUCTS

THE RUSSELL MANUFACTURING CO.

Middletown, Conn.

New York - Chicago - Detroit - San Francisco

Omni-Range Trainer

United Air Lines has perfected a portable VOR (omni-range) receiver for use in training and monitoring ranges now being installed by the Civil Aeronautics Administration.

E. A. Post, United's superintendent of navigational aids, uses a small standard receiving unit as the basis of his set. The receiver, mounted in a lightweight carrying case with special lead wires attached, can be hooked up in any transport plane in a few minutes. The set is connected directly to the aircraft's localizer receiver.

Lead wires permit the box to be placed in the regular radio rack in the cockpit while the dial unit which indicates the various compass courses can be placed conveniently in front of the pilot.

United is demonstrating the unit at major stations on its system. Post says it fills a definite need since VOR still is in the process of being set up on the airways and few pilots are familiar with it. The device allows a check on the accuracy of operation of newly installed VOR ranges.

SHORTLINES

▶ **American Airlines**—Began selling summer and fall vacation tours to Mexico, New England, Nova Scotia, Bermuda and Hawaii. Bargain tours can be purchased in conjunction with American's family fare plan . . . Carrier's Convair-Liners finished their first year of scheduled service last month, carrying 1,032,000 passengers a total of 265,900,000 passenger miles.

▶ **Braniff International Airways**—Recently marked its 21st year of operations. Carrier claims revenue passenger miles in the last ten years increased 1150 percent . . . Braniff appointed Frank McPherson cargo representative at Love Field, Dallas.

▶ **Eastern Air Lines**—Stockholders increased by approximately 500 when members of the field and advisory board of directors used their director's fees for purchase of stock and winners in a recent management contest were awarded blocks of stock as prizes.

▶ **Iberia Airline**—Will make weekly flights between Madrid and San Juan, Puerto Rico, when bilateral agreements are concluded with Venezuela and the U. S.

▶ **LAMSA**—Has inaugurated all-expense nine-day air tour from Juarez to Mexico City in conjunction with Guest Tours of Mexico. Cost is only slightly higher than regular air fare from the border to Mexico City.

▶ **National Airlines**—Has joined with P & O Steamship Co. to offer a joint tour between Havana and Miami. Passengers ride one way on one carrier, return on the other, at no added cost.

▶ **Northwest Airlines**—Took delivery on the first of an order of ten Stratocruisers at Boeing Airplane Co.'s Seattle plant. Craft is the first delivered for domestic service . . . NWA's May revenues were the largest for any month in the carrier's history, according to Croil Hunter, president and general manager. Gross revenue was $3,578,729; net was $524,661, compared to a net loss of $22,030 in May, 1948. Freight and express revenues in May accounted for nearly $250,000 of total revenues.

▶ **Pan American Airways**—Named Richard S. Mitchell superintendent of stations for the carrier's Latin American division. He was formerly vice president-operations for TACA and has been in PAA's operations department since September. Carrier last week celebrated its tenth anniversary of regular trans-Atlantic passenger service.

▶ **Panagra**—Started twice weekly tourist class service to Buenos Aires and points along the west coast of South America. Carrier uses 54-passenger DC-4s.

▶ **Pioneer Air Lines**—Has distributed to 30,000 businessmen a booklet called "I Can't Afford Not to Fly," aimed at selling Pioneer and commercial aviation in the Southwest.

▶ **SABENA**—Plans to resume service to Lydda, Israel, from New York, with connections at Brussels. Carrier will operate two flights weekly.

▶ **Swissair**—Will add a third weekly flight between Zurich/Geneva and New York.

▶ **Trans Caribbean Airways**—Is closing its third equipment trust financing through Gearhart, Kinnard & Otis, Inc. Issue is for $150,000, bears interest at 7 percent and matures in three years.

▶ **Western Air Lines**—Began nonstop Convair-Liner service between Los Angeles and Portland Oregon. The 868-mile trip will take 3 hr. 45 min.

CAB SCHEDULE

July 6—Resumption of hearings on seasonal service to Lake Tahoe. (Docket 3623)

July 18—Hearing on Mid-Continent Airlines' proposed acquisition of Parks Air Lines. (Docket 3782)

July 18—Hearing on renewal of Pioneer Air Lines' feeder certificate and suspension of service at points on routes of Braniff, Continental and American. (Docket 3719)

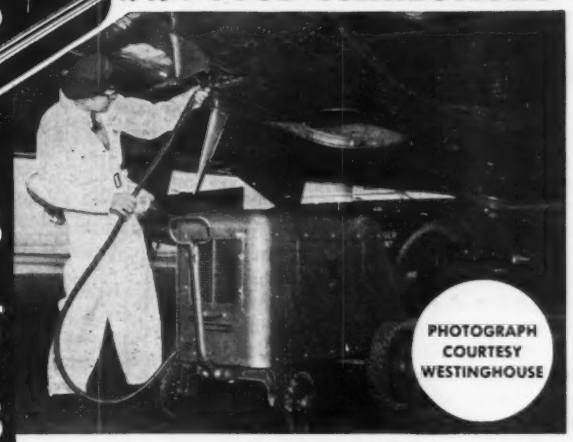
Aug. 8—Hearing on Carco Air Service's lightplane route application. Postponed from June 20. (Docket 3629)

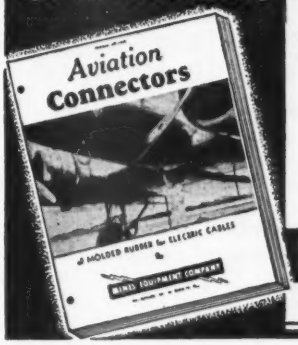
Aug. 15—Hearing on Hughes Tool Co. control of TWA. Postponed from July 18. (Docket 2796)

Sept. 26—Hearing on Seaboard & Western and Transocean Air Lines applications for all-cargo certificates between the U. S. Europe and the Middle East. (Dockets 3041 and 3818)

DEPENDABLE Performance STARTS – with GOOD CONNECTIONS

MINES CONNECTORS Make TODAYS BEST ELECTRICAL CONNECTIONS





WESTINGHOUSE ELECTRIC Uses MINES' female plug A3-437F to connect Airplanes to their Rectox Portable Engine Starter and ground power supply. (See photographic reproduction above.)

Many other vital aircraft and airport electrical connections can be made quicker, easier and safer with MINES *job proven* line of Molded (Neoprene) Rubber Connectors. Get complete details without delay. Write for free bulletin AVIII illustrated at left, NOW.

MINES EQUIPMENT COMPANY
4264 CLAYTON AVE. MINES ST. LOUIS 10, MO.

complete.. FROM 1 SOURCE!

QUALITY • ECONOMY • DEPENDABILITY

All types of airline equipment carefully packed and stored in our warehouses represent a wide selection designed to meet immediate demand. Expert "pre-shipping" inspection assures you delivery of top quality, ready-to-use materials!

Ready for immediate delivery are: Douglas Airframe Parts . . . Bushings and Spacers . . . Vibration Mounts . . . Hardware . . . Windows . . . C-54 Cowl Links . . . DC-3 Cowl Flap and Vibration Mount Kits!

● A large United Airlines stock of Douglas parts and equipment is for sale from our warehouses NOW! Write for information and listings today!

TWX BRB 7078 • Cable: MOULTAIR • CHarleston 0-2171

The MOULTON COMPANY, inc. AIRCRAFT PARTS • MANUFACTURERS • DISTRIBUTORS
3210 WINONA AVENUE • BURBANK, CALIFORNIA

LETTERS

Prop Reversals

We noted with interest the account (AVIATION WEEK, June 6) of the recent unintentional propeller reversal on an American Airlines Convair-Liner in your "Industry Observer" column.

From discussions with American Airlines personnel and the report of our service representative, it is understood that this incident was due entirely to malfunctioning of the airplane throttle lock mechanism, and the Curtiss propeller installation was not at fault in any way. We are not aware of a study "to determine if any basic modifications of propeller equipment are required," as stated in your article.

As you know, the use of reverse thrust for landing brakes was pioneered and developed by Curtiss-Wright through many hours of careful engineering and testing. CAA approval was granted only after stringent tests and study of requirements. Our records show that over 226,000 scheduled airline reverse thrust landings have been made to date with Curtiss propellers, and are accumulating at the rate of more than 4000 per week. We are quite proud of the safety record established with this new feature, particularly since reversible propellers have been credited for preventing loss of aircraft and possible loss of lives.

In view of the above, we would appreciate your confirming these points with American and printing a clarification in a future issue of AVIATION WEEK.

HAROLD H. WARDEN, Manager
Installations Department
Propeller Division
Curtiss-Wright Corporation
Caldwell, N. J.

(Our story did not state that the propeller itself was at fault. Later reports indicated that a relay failed on the control device between the throttle and nose wheel. American informed the ATA it had made a study and had decided to modify the "propeller equipment."—Ed.)

'Fair Reporting'

Dear Bob:

Just a line to thank you for your full and fair reporting of the "Van Zandt Incident." I appreciated it. Hope to see you soon.

W. STUART SYMINGTON

Woops! Sorry

Your May 16 issue, in "Air Force Calls for New Fighter Designs," by Robert Hotz, says "Fighters that can take up to 7G stress at 20,000 ft. will pull off their wings in 2½G turns in the thin atmosphere above 40,000 ft."

I have always thought that a G was a G, and that the forces resulting from applying these accelerations were the same, regardless of altitude. I think the author intends to say that the subject airplane will not fly through a turn which requires greater than 2½G while at 40,000 ft.

LT. COL. ROBERT A. ELDER, USAF
Research and Development Board
Committee on Aeronautics
Washington 25, D. C.

(Reader Elder is right. The writer meant to say that fighters that can maneuver under stresses up to 7Gs at low altitudes find their maneuverability restricted to as little as 2½G turns because of the effect of their highly loaded wings in the thin atmosphere above 40,000 ft.—Ed.)

Fire Article Praised

"How to Cut Crash-Fire Dangers" by Neill G. Bennett, in AVIATION WEEK June 20 is the best article I have read on this subject. It is very instructive and clarifies some of the confusion which has too long existed. I would like to order three extra copies of this particular issue.

J. VICTOR DALLIN, Chief
Bureau of Aeronautics
Philadelphia 42, Pa.

(Simmonds Aerocessories, 105 White Plains Road, Tarrytown, N. Y., the U. S. licensee of Graviner equipment, is preparing reprints of Comdr. Bennett's article.—Ed.)

Navy Slip-Up

Why must you repeat the error that the XAJ-1 and AJ-1 airplanes are powered with Wasp Majors when it has been publicly announced elsewhere that the engines are R-2800s?

A. H. B.

(Our Washington News Editor reports that the Navy originally gave AVIATION WEEK the incorrect information as part of a caption accompanying a photograph that was not released generally to the press. We are sorry to have perpetuated the error.—Ed.)

P. O. Complaint

Today I received your latest form letter inquiring why I have allowed my subscription to expire . . . Here's why:

Your magazine arrives any day in the week from Monday through Friday. Not only that, your magazine arrives looking like it had spent a rough week-end in a local bar. The cover, more often than not, is either torn or hanging by one staple. The pages, having spent the week-end along with the cover, are also torn or else no longer stapled to the cover. I find it rather difficult to read a magazine in this shape, and it certainly doesn't make me feel any better when someone sees the magazine in this shape. . .

ROBERT E. ABBOTT
410 South Clinton St.
East Orange, N. J.

(We hope if there are other subscribers with a similar complaint that they will report the details to us. We can assure our readers that our printers deliver the magazines to the Post Office on schedule and in perfect condition. What happens thereafter is up to the postal employes, and the Department has always been willing to investigate such complaints as Mr. Abbott's.—Ed.)

Engine Switch

Under the title "Engine Switch" on page 7, May 30 AVIATION WEEK there appears the following:

"Trans-Canada Airlines will shortly touch off a major political row when it carries out its plans to switch from British Rolls-Royce Merlin engines to Pratt & Whitney R-2800 engines on its DC-4M transports built by Canadair.

"Canadian sources indicate the switch will be made shortly after the Canadian Federal election on June 27. Present plans call for Douglas Aircraft Corp. to furnish complete power eggs for the TCA DC-4M since it uses the same wing as the American-built DC-6."

If it can be assumed that your publication is interested in the accuracy of its reporting, you will no doubt wish to be advised that TCA does not, and has never planned the replacement of the British Rolls-Royce Merlin engines in its North Star M 2 aircraft, that TCA has carried on no negotiations with any firm having this end in view, and that the "Canadian sources" to which you refer are either non-existent or grossly misinformed.

G. R. McGREGOR, President
Trans-Canada Air Lines
Winnipeg, Manitoba, Canada

Nine Old Test Pilots

Enclosed find a check for $6 in payment for a one year subscription to AVIATION WEEK. In this section we have nine experimental test pilots who depend on AVIATION WEEK to keep us informed of what is going on in the aviation world. Lately, we have fallen behind in our education because AVIATION WEEK has not been appearing in our section. . . . As we have stated before, we need AW . . . so please accept our check. It represents a contribution from each pilot here.

NINE OLD TEST PILOTS
c/o Chief, Fighter Operations Section
Flight Test Division
Wright-Patterson AF Base
Dayton, Ohio

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • PLANES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE

90¢ a line, minimum 4 lines. To figure advance payment count 5 average words as a line.

INDIVIDUAL EMPLOYMENT WANTED undisplayed advertising rate is one-half of above rate, payable in advance.

PROPOSALS 90¢ a line an insertion.

INFORMATION

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 1 line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE

The advertising rate is $10.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

NEW ADVERTISEMENTS received Friday will appear in the issue mailed the following Friday subject to limitation of space available

GRADUATE ENGINEERS FOR DESIGN AND DEVELOPMENT

of rocket motors and missile launching equipment. Positions open for experienced design, development, and instrumentation engineers in growing research development, and production organization. Salary open.

P-9267, Aviation Week
621 S. Hope St., Los Angeles 14, Calif.

Attention Flight Personnel

A. T. R. Pilots, certificated flight engineers, flight navigators, flight radio operators, flight dispatchers, etc. We are currently accepting applications for present and anticipated openings for local and overseas assignments. Contact us immediately.

NEW AGE PERSONNEL AGCY., INC.
55 W. 42nd St. N. Y. 18, N. Y.
(Write or Call BR yant 9-0006

Need A Pilot? Need A Job?

Are you qualified to fly the Atlantic, to instruct, to fly charter, to dust, or to help organize a new airline We can help you find the job you need, or the man you need. No registration fee.

PILOTS EMPLOYMENT AGENCY
Box 152, Whippany, N. J.

FOR SALE

MAJOR METROPOLITAN AIRPORT

Popular private airport near Los Angeles—3200 ft. runways, large industrial hangar and individual hangars—75% macadam paved. A successful going "In City" airport on major highway —

N. M. SAUNDERS CO.
210 W. 7th St., Los Angeles 14, California

AIRCRAFT & ELECTRONIC EQUIPMENT

As a leading supplier we offer a complete line of

BRAND NEW INSTRUMENTS

- **FLIGHT & NAVIGATION INSTRUMENTS**
- **ENGINE INSTRUMENTS**
- **AUTOMATIC PILOTS**
- **INVERTERS**
- **AUTOSYNS**
- **PRECISION AUTOSYNS**
- **RATE GENERATORS**
- **SINE-COSINE GENERATORS**
- **SYNCHROS**
- **ALNICO FIELD MOTORS**
- **GYROS**
- **A.C. MOTORS**
- **D.C. MOTORS**
- **SERVO MOTORS**
- **TORQUE UNITS**
- **TORQUE AMPLIFIERS**
- **FREQUENCY METERS**
- **BLOWER ASSEMBLIES**

Write for complete listings

All Instruments May Be Purchased
C.A.A. Certified
U. S. Export License-2140

WUX Flushing, N. Y.

INSTRUMENT ASSOCIATES
147-57 41st AVENUE, FLUSHING, N. Y.
Tele: INdependence 3-1919

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

ENGINEERS: FOR professorships all engr. fields. Master's and Doctor's qualify unusually fine positions $4500-7000 nine months. Instructors, bachelors. Give phone, photo, qualifications. Cline Teachers Agency, East Lansing, Mich.

AIRCRAFT DIVISION Manager wanted to take charge of Engineering and Sales with a manufacturer of aviation equipment. Must be thoroughly experienced in design and performance of military aircraft and must have wide knowledge of the aircraft industry as well as the armed forces. Only men with a proven record in the design and marketing of aircraft equipment will be considered. P-9301, Aviation week.

FOR SALE

Cessna #195.
Oil company will dispose of one ship of this type. Airplane is equipped with the best in radio, parachutes, instruments, etc. A beautiful airplane; just a year old; low time; outstanding in every way. Please address inquiries to: S. S. McDonald, Jr., Wood River Oil & Refining Co., 501 KFH Building, Wichita, Kansas.

FOR RENT

120' x 100' steel, insulated,
heated hangar with 20' x 100' leanto at Class 3 airport with 4,000 foot hard surface runways located within 20 minutes flying time from Washington or Baltimore. Ideal location for fixed base operator. Gasoline concession available if interested. S. J. Mannette, Cities Service Oil Company, Box 148, Easton, Maryland.

BUSINESS OPPORTUNITY

Financing available
for Government Aviation Engineering and Development Contracts. Can also supply Engineering, Test Laboratory or Manufacturing assistance. BO-9280, Aviation Week.

COMPLETE ENGINE OVERHAUL SHOP WANTED

Machine tools, hand tools, parts for overhauling the following engines: Pratt Whitney R985, R1830, R2000, R2800, Wright R2600. If possible, quotations should include export crating of all materials and equipment. Send full price details, inventory list, and address where equipment may be inspected.

INTERNATIONAL AEROMARINE, INC.
Alcazar Hotel, Miami, Florida

PROFESSIONAL SERVICES

S. B. BARNARD, LL.B., M.E.
Registered Patent Attorney
Mechanical, Electro-mechanical, Automotive and Aircraft Patents.
PATENT ANALYSES and INVESTIGATIONS.
29-28 41st Avenue, Long Island City 1, N. Y. STillwell 4-5428

SCHOOLS

Rising Sun SCHOOL OF AERONAUTICS
ESTABLISHED 1930
"Built Upon the Success of Its Graduates"
GOVT. C.A.A. and VETERANS APPROVED
ENROLL NOW FOR NEXT CLASS
Write for Illustrated Catalog
2206-16 E. HUNTINGDON ST., PHILA., PA

CERTIFIED INSTRUMENTS

DIRECTIONAL GYROS
AN-5735-1-PN646050-Sperry $59.50
AN-5735-1-PN649742-Sperry 89.50

GYRO HORIZONS
AN5736-1-PN-Ternstedt-95100 ..... $49.50
AN5736-1-PN-Sperry-646040 ..... $59.50
AN5736-1-PN-Sperry-676768 ..... $89.50

ALTIMETERS
KOLLSMAN type C-12 (0 to 50,000 ft) new $19.50
KOLLSMAN type C-13 (0 to 35,000 ft) certified $17.50
PIONEER, all types, (6 o'clock set) certified $24.50

Our stock inventory of over 15,000 aviation instruments is your source of supply. SEND US YOUR REQUIREMENTS.

All of our instruments certified by CAA approved shop 5272

TEL. PORTSMOUTH 7-4008

AVIATION SUPPLY CO.
6207 So. Cicero Ave., Chicago, 38, Illinois
Suppliers of Aircraft Accessories

SUPER CRUISER 96 HOURS, AEROMATIC, PRIMARY GROUP, RADIO, SKIIS. BETTER THAN NEW AT LOWEST PRICE.
STINSON 150 VOYAGER 300 HOURS, SPECIAL PAINT JOB 22 COATS YELLOW AND BLUE, NEW BATTERY, TIRES AND PROP. PERFECT CONDITION. BOTH AIRPLANES PRIVATELY OWNED AND HANGARED. PRICED TO SELL.

ARTHUR VUNDERINK
509 Grove Clarks Summit, Pa.

FOR SALE

4 BEECHCRAFT D-18-C(T)—CAR 04b

1 BEECHCRAFT D-18-S—CAR 03

4 CONTINENTAL R9A ENGINES
Overhauled, Pickled and Boxed

1 PRATT & WHITNEY R-985—14-B
Drilled for Hydramatics

Aircraft and Engines low time since major overhauled—Polished—Waxed. In near new condition. Licensed spring 1950.

Engine and Instrument Overhaul Shops—Signal Generators, ARC-1's, MN-26-K's, Marker Beacons, Link Trainer, Beech spares.
Aircraft approved—4500 hrs. between overhaul
Engines approved—700 hrs. between overhaul
Propellers approved—1400 hrs. between overhaul

This excellent equipment permitted over 3 million passenger mile accident free air carrier operation and the highest schedule completion (99.6%) of ANY certificated airline in the world—Contact . . .

JOSEPH L. DYER - - - - - - - - - M. D. HOLMAN

FLORIDA AIRWAYS, INC.

BOX 591 ORLANDO, FLA.

FOR SALE!

DC-4 (C-54-B-DC) 50-PASSENGER AIRPLANES

$125,000.00 and up

plus 2% sales tax

- Equipped with P. & W. R-2000-13 (2SD13G) Engines.
- Recently removed from scheduled passenger service.
- Standard airline interior.

"AS IS" MUNICIPAL AIRPORT, TULSA, OKLAHOMA

Address all inquiries to:

AMERICAN AIRLINES, INC.
Att: Director of Surplus Sales
43-02 Ditmars Boulevard, Astoria, Long Island, N. Y.
(Telephone RAvenswood 8-1000)

Several good used Cessnas, Ercoupes, Heroncas and other aircraft at reduced prices.
WIRE, PHONE OR WRITE FOR DETAILS
Inspection Invited
CENTRAL AIRPORT
Camden 11, N. J.
(C. D. Binet)

SPECIAL

Beech C18S....Just converted....Licensed to May, 1950....Special soundproofing.... beautiful interior.....Cost $35,000.00..... sacrifice at $19,500.00.

PACIFIC AIRCRAFT SALES COMPANY
Lockheed Air Terminal Burbank, California
CHarleston 0-4811

WHAT'S NEW

New Books

"The Army Air Forces in World War II," second of a seven-volume series published by the University of Chicago Press. Volume covers the European and Mediterranean theaters.

"Unified and American Screw Threads," for screws, bolts, nuts and other threaded parts, published by the American Society of Mechanical Engineers, 29 W. 39 St., New York 18, price $3.

Trade Literature

"Census of Manufactures, 1947," a booklet on aircraft and parts, available on request to Department of Commerce, Bureau of Census, Washington 25, D. C.

"The Marshall Plan," a booklet of information for Americans going abroad, published by the Office of Information, Economic Cooperation Administration, Washington 25, D. C.

"Catalog No. 140," describing Meco welding equipment, is available on request to Modern Engineering Co., Dept. 104, 3415 West Pine Blvd., St. Louis 3.

"Bulletin 504," apparatus notes on stopwatches, chronographs, timers and tachometers, available on request to Andrew Technical Service, 4747 N. Damen Ave., Chicago 25.

"Shop Notes on Heat Treating of Steels," a booklet discussing procedures and tips, available on request to Cooley Electric Mfg. Corp., 38 South Shelby St., Indianapolis 7.

Bulletin DB-1," covering motors, grinders, buffers and gearshfit drives, available on request to Lima Electric Motor Co., Lima, Ohio.

"Truck Snow Plows," a 24-page catalog with illustrations, available on request to Baker Mfg. Co., Springfield, Ill.

"Powdered Metal in Your Production Picture," an eight-page booklet introducing a range of new applications for powdered metal fabrication processes. Available upon request to Powdered Metal Products Corp. of America, 9335 West Belmont Ave., Franklin Park, Ill.

Folder, describing aircraft ground auxiliary power supply units, available upon request to Motor Generator Corp., Hobart Square, Troy, Ohio.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—JULY 4, 1949

Airborne Accessories Corp. 8
Agency—Weber Thomson Associates

American Airmotive Corp. 43
Agency—Houck & Co. of Florida, Inc.

Axelson Mfg. Co. ..... Third Cover
Agency—Heintz & Co., Inc.

Chase Aircraft Co., Inc. 25

Chicago Pneumatic Tool Co. 8
Agency—G. M. Basford Co.

Darnell Corporation, Ltd. 47
Agency—Rhea Advertising Service

Douglas Aircraft Co., Inc. 38
Agency—J. Walter Thompson Co.

Foote Bros. Gear & Machine Corp. Fourth Cover
Agency—The Buchen Company

Gilfillan Brothers, Inc. 5
Agency—Davis & Company

Hansen Mfg. Co., The 31
Agency—Richard T. Brandt, Inc.

Hastings Instrument Co., Inc. 48

Hi-Shear Rivet Tool Co., The 40
Agency—John T. Hales Co.

Kester Solder Co. 46
Agency—Frank C. Nahser, Inc.

Kidde & Co., Inc., Walter 3
Agency—Newell-Emmett Co.

Line Material Company ..... Front Cover
Agency—Hamilton Adv. Agency, Inc.

Lockheed Aircraft Corp. 28, 29
Agency—Foote, Cone & Belding Adv.

Micro Switch Corp. 10
Agency—Hamilton Adv. Agency, Inc.

Mines Equipment Co. 49
Agency—Ross Advertising Agency

Moulton Co., Inc., The 49
Agency—Jaycraft Company

Parker Appliance Company 19
Agency—Fuller & Smith & Ross, Inc.

Roebling's Sons Co., John A. 4
Agency—Beatty & Oliver, Inc.

Russell Mfg. Company, The 48
Agency—Charles W. Hoyt Co., Inc.

Ryan Aeronautical Company 35
Agency—Batten, Barton, Durstine & Osborn, Inc.

Ryerson & Son, Inc., Joseph T. 53
Agency—Aubrey, Moore & Wallace, Inc.

Searchlight Section 50, 51, 52

Skinner Purifier Div. of Bendix Aviation Corp. 20
Agency—MacManus, John & Adams, Inc.

Surface Combustion Corp. 23
Agency—Odiorne Industrial Adv.

Texas Company, The 6
Agency—Buchanan & Co., Inc.

Tomkins-Johnson Co., The 48
Agency—Beeson-Faller-Reichert, Inc.

Westinghouse Electric Corp. ..... Second Cover
Agency—Fuller & Smith & Ross, Inc.

Wright Aeronautical Corp. 9
Agency—Charles Dallas Reach Co., Inc.

SEARCHLIGHT SECTION
(Classified Advertising)

EMPLOYMENT
Positions Vacant 51
Employment Agencies 51

EDUCATIONAL
Schools 51

BUSINESS OPPORTUNITIES
Offered 51
Wanted 51

PROPERTY
For Rent 51

PLANES—EQUIPMENT
(Used or Surplus New)
For Sale 51-52

Aircraft Steels Also in Stock

Phone for Quick Service

To serve manufacturers participating in the air force program, Ryerson service now includes steels meeting Army-Navy Aeronautical specifications. Many types of aircraft quality alloys and aircraft quality stainless are ready for quick shipment from convenient Ryerson stocks.

When you use Ryerson aircraft alloys you not only meet government "specs." You also have an extra assurance of dependable performance because we test every heat for hardenability and send the test results with your steel.

For extra dependability in aircraft stainless steel we stock Allegheny stainless made by America's first and largest stainless producer.

Of course we continue to offer quick service on standard specification steels as well—and our stocks of alloy, stainless and tool steels are unusually complete. So for quick service on steel-from-stock requirements—aircraft or standard specification—call your nearby Ryerson plant.

RYERSON STEEL

Joseph T. Ryerson & Son, Inc. Plants: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles, San Francisco

EDITORIAL

(For two years AVIATION WEEK*'s editorial page, in an effort to be constructive, has been persistently critical of some policies of the airlines (as well as the government), in our firm belief that some of those policies were retarding rather than advancing commercial air transportation. During that period we have been described in some industry and trade circles as "naive," as not understanding airline problems, and as failing to "realize" that air transport is "different" because normal business and economic rules do not apply. We have always maintained that air transportation should be conducted as a business. Recently, there is beginning to be expressed within the industry itself some of the same contentions so familiar to readers of this page. We shall reprint some from time to time. The first is below.—R.H.W.)*

Airline President Looks at Fares & Coaches

Extracts from two Northwest Airlines Press Releases

Northwest Airlines charged today that attempts by other airlines to block extension of air coach service at low tourist rates are in direct opposition to the public interest and a manifest public need.

The company pioneered an early air coach service between Seattle and Anchorage, Alaska, and was the first scheduled airline to offer transcontinental coach service.

"For the CAB or any other airline to impede the development of this new public service (especially a proposed Chicago-Portland coach—Ed. Note) would be unfair to the airlines and to the public, which has plainly indicated its enthusiasm for a chance to travel by air at a cost comparable with coach class ground transportation," Croil Hunter, president of Northwest, said.

Hunter declared that Northwest's experience with its transcontinental coach flights since their inception March 24 has proved three points beyond doubt:

1. Air coach service appeals to a large, new class of travelers, who have brought load factors to an average of higher than 90 percent on coach flights.

2. Coach service does not detract from business on first class flights—it may in fact, even be a factor in stimulating travel generally. A rise in business on all Northwest's flights has accompanied the capacity business on the coach planes.

3. Extended development of coach service may be a large part of the answer to airline financial problems, and is a highly profitable phase of overall operations. . . .

"The government, airline management and the interested public have been greatly concerned about financial problems during the post-war years," Mr. Hunter said. "Now this new development, coach class air travel, gives every indication of being a major factor in putting the airlines into the black financially. Surely common sense and a realistic attitude would indicate encouragement of coach service where it is clear it is developing profitable new traffic and dipping deeply into a market hitherto scarcely touched by the airlines."

To back up his contention that the public thoroughly approves of Northwest's coach flights, Hunter pointed out that since the one scheduled round trip a day began March 24, NWA's coach planes have carried 20,098 passengers a total of 20,596,822 passenger miles. Load factors on both eastbound and westbound flights have been consistently high, running in excess of 93 percent on eastbound flights and, during the first half of June, above 91 percent for both east and westbound.

That this extremely high load factor was not at the expense of load factors aboard Northwest's regular, standard flights is also evident.

Flight 10, a standard eastbound coast-to-coast flight paralleling the coach route, had a better than 70 percent load factor during May. Flight 7, a westbound flight, had a load factor of better than 61 percent out of New York to Minneapolis.

As for the charge in some quarters that coach fares are unprofitable, Hunter noted that Northwest's revenue for May from coach operations was $342,286—a tremendously high figure when it is considered that it represents only one round trip a day between the New York and Seattle terminals. . . .

In its formal answer to United's objections, filed with the CAB, Northwest pointed out that all airlines had found that higher fares merely caused the air travel market to shrink, and meant lower total income. Northwest's pioneering experience with coach fares, on the contrary, has been "outstandingly successful."

Lower fares, not higher ones, offer the best promise of developing the air transportation market. . . . Northwest pointed out that during 1948 it made several fare increases on the theory that because of increased costs, increased fares were necessary. However, experience shows that each such fare increase resulted in further limiting the potential market for air transportation, and its total revenues were not correspondingly increased.

In explaining factors which made possible its coach service at reduced fares, the airline cited the better utilization of equipment, the reduction of idle airplane time, the elimination of luxury services, and the conversion of DC-4 equipment to a combination cargo-passenger type through the use of folding seats, thereby accommodating directional cargo movement.

Northwest's proposed one-way fare of $70 between Chicago and Portland would yield Northwest 3.84¢ per mile on the basis of the mileage flown over Northwest's route between Chicago and Portland. On the basis of the average passenger load factors of 87.03 percent experienced on Northwest's 55-passenger airplane coach services for the month of May, 1949, on the basis of most recently experienced operating costs, it is clear that the proposed service will be profitable.

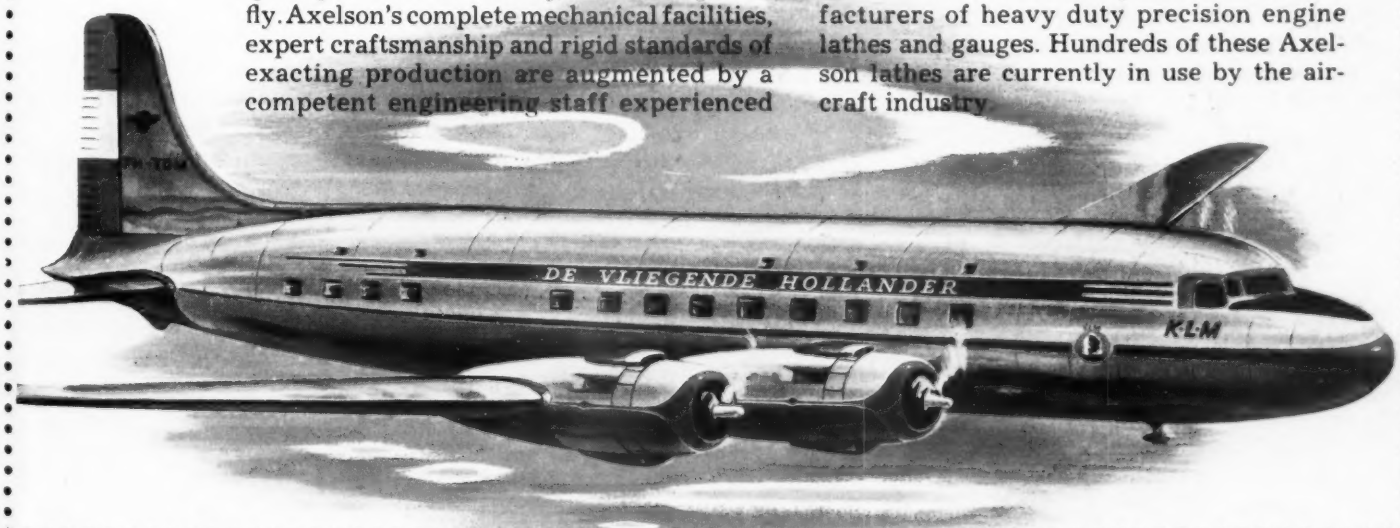
Mr. J. Luymes,

Vice President – Engineering and Maintenance
KLM Royal Dutch Airlines

"We salute the American ingenuity that allows us to fly over rough weather with safety and comfort for our passengers. The Axelson-built superchargers and drive assemblies on our Douglas DC-6's are a tribute to fine precision manufacture."

Axelson-built aircraft components—hydraulic landing gears – cabin superchargers – gears and gearing mechanisms – are recognized around the world for highest precision quality wherever military or civilian planes fly. Axelson's complete mechanical facilities, expert craftsmanship and rigid standards of exacting production are augmented by a competent engineering staff experienced and capable in helping aircraft manufacturers develop component parts for tomorrow's planes.

Through the years, Axelson has been noted as one of the country's foremost manufacturers of heavy duty precision engine lathes and gauges. Hundreds of these Axelson lathes are currently in use by the aircraft industry.



THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

AXELSON *Aircraft Division*

AXELSON MANUFACTURING COMPANY

6160 South Boyle Avenue, Los Angeles 11, California

The B-36
BM-004
IN THE PROPELLERS ARE
gears made by Foote Bros.
Typical gears produced by Foote Bros. used in the Pratt & Whitney Wasp Major.
Two precision gears produced by Foote Bros. used in the large Curtiss-Wright reversible pitch propeller.
FOOTE BROS.